



Spray Falls on Bow River at Banff, Alberta. Taken by H. J. Lewis, M. E.

DEPARTMENT OF THE INTERIOR

DOMINION OF CANADA

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REPORT  
OF  
PROGRESS OF STREAM MEASUREMENTS  
FOR  
THE CALENDAR YEAR 1912

---

PREPARED UNDER THE DIRECTION OF

F. H. PETERS, C.E.,  
COMMISSIONER OF IRRIGATION.

BY

*P. M. SAUDER, A.M. Can. Soc. C.E., Chief Hydrographer.*

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1914



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*To His Royal Highness Prince Arthur William Patrick Albert, Duke of Connaught and of Strathearn, K.G., K.T., K.P., etc., etc., Governor General of Canada.*

MAY IT PLEASE YOUR ROYAL HIGHNESS:

The undersigned has the honour to lay before Your Royal Highness the Report of the Progress of Stream Measurements for the year 1912.

Respectfully submitted,

(Signed) W. J. ROCHE,  
*Minister of the Interior.*

OTTAWA, July 23, 1913.



DEPARTMENT OF THE INTERIOR,

OTTAWA, 23rd July, 1913.

The Honourable W. J. ROCHE, M.D.,  
Minister of the Interior.

SIR:—

I have the honour to submit the report of Stream Measurements for the year 1912, and to recommend that it be published as the fourth of a series of progress reports.

I have the honour to be, Sir,  
Your obedient servant,

W. W. CORY,  
*Deputy Minister of the Interior.*



SESSIONAL PAPER No. 25d

DEPARTMENT OF THE INTERIOR,  
Irrigation Branch.  
OTTAWA. July 23, 1913.

W. W. CORY, Esq., C.M.G.,  
*Deputy Minister of the Interior.*

SIR:—

I submit herewith the report of Stream Measurements for the year 1912, submitted by Mr. F. H. Peters, C.E., Commissioner of Irrigation, and would recommend that it be published.

Respectfully submitted,  
E. F. DRAKE,  
*Superintendent of Irrigation.*

DEPARTMENT OF THE INTERIOR,  
IRRIGATION OFFICE,  
CALGARY, ALTA., June 10, 1913.

E. F. DRAKE, ESQ.,  
*Superintendent of Irrigation,*  
Department of the Interior,  
Ottawa, Canada.

SIR:—

I have the honour to transmit herewith the manuscript of the Report of Progress of Stream Measurements for the calendar year 1912. This report has been prepared, under my direction, by P. M. Sauder, A. M. Can. Soc. C. E., Chief Hydrographer. I would recommend that it be published as the fourth of the series of Reports of Progress of Stream Measurements,

I have the honour to be, Sir,  
Your obedient servant,  
F. H. PETERS,  
*Commissioner of Irrigation*

DEPARTMENT OF THE INTERIOR,  
IRRIGATION OFFICE,  
CALGARY, ALTA., JUNE 4, 1913.

F. H. PETERS, ESQ., C.E.,  
*Commissioner of Irrigation.*  
Department of the Interior,  
Calgary, Alberta.

SIR:—

I beg to submit herewith the manuscript of the Report of Progress of Stream Measurements for the calendar year 1912.

In this report is given a brief outline of the methods of obtaining and compiling the data contained therein, but owing to the want of space and time many details have been omitted. The report presents in tabulated form all the records of stream flow collected during the year 1912 and those records collected during the year 1911 which were not included in the Report of Progress of Stream Measurements for that year.

I beg to recommend that this report be published as the fourth of the series of Reports of Progress of Stream Measurements.

I have the honour to be, Sir,  
Your obedient servant,  
P. M. SAUDER,  
*Chief Hydrographer.*





# REPORT

OF

## PROGRESS OF STREAM MEASUREMENTS FOR THE CALENDAR YEAR 1912.

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By P. M. SAUDER, C.E., Chief Hydrographer

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### INTRODUCTION

#### SCOPE OF WORK

The chief features of the stream measurement work are the collection of data relating to the flow of surface waters and a study of the conditions affecting this flow. Information is also collected concerning river profiles, the duration and magnitude of floods, irrigation, water-power, storage, seepage, etc., which may be of use in hydrographic studies.

This information is obtained by a series of observations at regular gauging stations which are established at suitable points. The selection of sites for these gauging stations and their maintenance depend largely upon the physical features and needs of the locality. If water is to be used for irrigation purposes the summer flow receives special attention; where it is required for power purposes, it becomes necessary to determine the minimum flow; if water is to be stored, information is obtained regarding the maximum flow. In all cases the duration of the different stages of the streams is recorded. Throughout the country gauging stations are maintained for general statistical purposes, to show the conditions existing through long periods. They are also used as primary stations, and their records in connection with short series of measurements will serve as bases for estimating the flow at other points in the drainage basin.

In the spring of 1912, field operations were commenced with one hundred and thirty-two (132) regular gauging stations on various streams in Alberta and Saskatchewan and thirty (30) on irrigation ditches, and at present the regimen of flow is being studied at one hundred and thirty-nine (139) regular gauging stations on streams and forty (40) on irrigation ditches. Winter records, which are so valuable for power investigations and municipal water supplies, have been given special attention latterly and records have been secured on almost all the important streams in these provinces during the past winter.

#### ORGANIZATION.

The methods of carrying on the investigations were similar to those of previous years. Local residents were engaged to observe the gauge height at regular gauging stations. These observations were recorded in a book supplied by the department, and at the end of each week the observer copied the week's records on a postal card which was sent to the chief hydrographer by the first convenient mail. The district hydrographers made regular visits to the gauging stations, usually once in every three weeks. On these visits they examined the observer's records, made discharge measurements and collected such information and data as would be of use in making estimates of the daily flow at the station. The results of the gaugings were transmitted by a postal card to the chief hydrographer. In the office these reports of the gauge height observers and the hydrographers were copied from the postal cards to regular forms and filed. At the close of the open season, some of the hydrographers returned to the office and assisted in the final computations and estimates of run-off. Gauge height-area, gauge height-mean velocity, and gauge height-discharge curves were plotted and rating tables constructed. Tables of discharge measurements, daily gauge height and discharge, and monthly discharge were also compiled. These records have been re-copied and are embodied in this, the Fourth Annual Report of Progress of Stream Measurements.

The organization in 1912 was very similar to that of the previous years. The regular staff consisted of the chief hydrographer, ten assistant engineers, one recorder, one computer and one clerk. In order to overtake back work, three Junior Engineers were also employed temporarily during the past four months. The territory was divided for administrative purposes, into nine districts, viz., Banff, Calgary, Macleod, Cardston, Milk River, Western Cypress Hills, Eastern Cypress Hills, Moosejaw, and Battleford. In each district there was an engineer and while in the field he had an assistant, and was equipped with the necessary gauging and surveying instruments. In the Banff, Calgary, Macleod, Moosejaw, and Battleford districts, the engineers travelled by train or hired livery, and stopped at hotels and stopping houses, while in the other districts they were supplied with a team, light wagon, and light camping outfit. The tenth engineer was employed at rating meters and office work during the summer.

As winter records are of no value on a great many of the smaller streams the number of gauging stations maintained during the winter months was much less than during the summer, and by re-arranging the districts five engineers were able to do all the field work during the winter. The other five engineers and the three juniors have compiled the records for the annual report.

#### BANFF DISTRICT

This district included the following regular gauging stations:

Stream	Location	Date established
Bow River.....	S.E. 28-28-16-5 ①	July 18, 1910
".....	N.E. 35-25-12-5	May 25, 1909
".....	N.W. 32-24-8-5	Feb. 1, 1912
Cascade River.....	S.E. 19-26-11-5	Aug. 16, 1911
Forty-mile Creek.....	S.W. 2-26-12-5	July 31, 1912
Ghost River.....	N.E. 23-26-6-5	Aug. 17, 1911
Jumpingpound Creek.....	Sec. 30-24-4-5	May 7, 1908
Kananaskis River.....	N.E. 33-24-8-5	Aug. 31, 1911
Pipestone River.....	S.W. 27-28-16-5	Aug. 31, 1911
Spray River.....	S.W. 25-25-12-5	July 15, 1910

As this district has been in operation for some time, and several new stations had been established after a thorough reconnaissance in 1911, very few changes were made in the Banff district during 1912. In a few cases the conditions have been so unfavourable that gauge readings could not be obtained all winter, but in almost every case discharge measurements have been made regularly at intervals of about two weeks during the whole year at all of the above stations excepting Forty-mile Creek, which was not established until July 31, 1912, and Jumpingpound Creek, which was not included during the winter months.

During the year miscellaneous gaugings were made of Baker Creek (S.E. 32-27-15-5), Bath Creek (N.E. 32-28-16-5), Beaupré Creek (S.E. 15-26-5-5), Big Hill Creek (S.W. 10-26-4-5), Grand Valley Creek (S.W. 24-26-5-5), Healey Creek (S.W. 29-25-12-5), Horse Creek (N.E. 8-26-4-5), Johnson Creek (S.W. 26-26-14-5), Louise Creek (N.E. 20-28-16-5), and Spencer Creek (S.E. 18-26-5-5), whenever possible.

Owing to the comparatively low flow of Bow River during the winter months, the Calgary Power and Transmission Company, which has a power plant in operation at Horseshoe Falls and is building another plant at Kananaskis Falls, found it necessary to store water to tide over this period, and during the spring of 1912 built a dam on Cascade River near the mouth of Devil's Creek to increase the storage capacity of Lake Minewanka. The dam was completed before the high water period in June and the reservoir was therefore filled last summer and emptied during the past winter. As this dam backs water up Devil's Creek the gauging station on this stream had to be abandoned, and it must be borne in mind, when using the records of flow of Cascade and Bow Rivers below Lake Minewanka reservoir, that after the first of June, 1912, the flow is affected by the operation of this reservoir and the records do not represent the true natural flow of the stream.

The town of Banff takes its domestic water supply from Forty-mile Creek, and as its requirements are gradually increasing it was thought advisable to take records of the flow of this stream. It is, however, impossible to get an observer above the intake of the water works and the station had to be established below the intake. The records, therefore, only represent the surplus flow which is not used by the town, and the consumption of the town has to be added to obtain the total natural flow of the stream.

Bath Creek is an important tributary of Bow River but no regular station has been established on it as it has been impossible in the past to secure an observer. This difficulty may not exist in future, and in such a case, a regular gauging station will be established.

Records will also be taken in future of the flow of Louise Creek, which is used by the Canadian Pacific Railway Company to develop power for use at the Lake Louise Chalet.

①—This Station was originally on N.E. 28-28-16-5, but was moved to its present position on Aug. 31, 1911.

## SESSIONAL PAPER No. 254

The dam being constructed by the Calgary Power and Transmission Company at Kananaskis Falls will flood out the present gauging station on Kananaskis River and it will soon have to be re-located further upstream.

Further power development of Bow River depends very largely on the creation of storage reservoirs, to conserve flood water for use during the winter months, and during 1912 the Water Power Branch continued and completed its investigations of the upper regions of Bow River drainage basin. Whether any new stations are established in this district or any of the present ones are abandoned will depend largely on the report of the Water Power Branch and it is therefore awaited with much interest.

V. A. Newhall, B. A. Sc., was in charge of the field work in the Banff district during January and February of 1912, and H. C. Ritchie, Grad. S.P.S., was in charge during the remainder of the year. The final computations were made by F. R. Steinberger, B.E.

## CALGARY DISTRICT

This district included the following regular gauging stations:

Berry Creek.....	N.E. 21-23-13-4	May 30, 1911
Blood Indian Creek.....	S.W. 10-23-8-4	June 26, 1911
Bow River.....	N.E. 15-24-1-5	Nov. 25, 1910
".....	Sec. 13-21-19-4	By C.P.R. Co. on Aug. 20, 1909
Can. Pac. Ry. Co. canal.....	N.E. 36-23-1-5	May 9, 1908
Elbow River.....	S.W. 14-24-1-5 ①	May 8, 1908
Findlay & McDougal Ditch.....	S.W. 31-18-29-4	June 17, 1911
Fish Creek.....	S.W. 28-22-3-5	May 13, 1907
Highwood River.....	S.E. 20-18-2-5	July 27, 1912
".....	N.W. 6-19-28-4	May 28, 1908
".....	N.W. 17-20-28-4	Oct. 3, 1911
Little Bow Ditch.....	S.W. 6-19-28-4	Aug. 1, 1910
Nose Creek.....	N.W. 13-24-1-5	Apr. 24, 1911
Pekisko Creek.....	N.W. 8-17-2-5	Oct. 6, 1911
Sheep River.....	N.W. 22-20-29-4	May 25, 1908
N.B. Sheep River.....	S.W. 12-21-3-5	May 22, 1908
S. B. Sheep River.....	S.W. 17-20-2-5	May 23, 1908
Stimson Creek.....	N.W. 2-17-2-5 ②	Oct. 6, 1911

This district is the same as in 1911, except that a regular gauging station has been established on Highwood River above the mouth of Pekisko Creek. While this station was established primarily for statistical purposes, its records will probably be of considerable value in determining the possibilities of power development in this stream.

There were no special developments in this district during 1912, but as the canals being constructed by the Canadian Pacific Railway Company, the Southern Alberta Land Company, and the Alberta Land Company, are nearing completion, the value of the records of stream flow becomes more apparent. The first company will no doubt require more than the average low water flow of Bow River, and the other two depend entirely on the high water and flood discharge of the river for their water supply. Not only is it necessary to know the discharge of the river at these stages but also the duration of each stage.

The Southern Alberta Land Company and the Canadian Pacific Railway Company both anticipate the diversion of water throughout the whole of the open flow period, and anticipate a diversion that will approach the whole of the flow of the river so that the conditions of diversion for these large companies are becoming critical.

These problems cannot, however, be satisfactorily solved without records of stream flow covering a period of several years, and now that there are nearly five years' records of the flow of Bow River at Calgary approximate estimates can at least be made.

In designing a dam it is essential to know the maximum flood discharge of the stream in order to provide the necessary spillway to pass it without injury to the structure or adjoining property. During the past year all available data regarding the floods on Bow River was collected and estimates of the maximum flood discharge at different points were made. The results of this study are given under the heading of Bow River drainage basin.

Miscellaneous gaugings were made of Red Deer River, East Branch of Berry Creek, Bullpound Creek, North Branch of Fish Creek, South Branch of Fish Creek, Pine Creek, Tongueflag creek, Lineham's Spillway at High River and a spring at McMillan's ranch near High River, whenever possible.

Owing to the excessive cost and difficulty of securing accurate records, it has been decided to discontinue the gauging stations on Berry and Blood Indian Creeks until some new railway line makes it easier and less expensive to reach them.

①—This Station was originally on N.E. 15-24-1-5, but was moved to its present position in Nov., 1911.

②—This Station was originally on S.E. 14-17-2-5, but was moved to its present position in July, 1912.

The only gauging stations in this district that were maintained during the winter months were those on Bow and Elbow Rivers at Calgary. These were included in the Macleod district during the winter months.

F. R. Burfield, A.M.I.C.E., was in charge of the field work in this district during 1912, and also made the final computations for this report.

#### MACLEOD DISTRICT.

This district included the following regular gauging stations:—

Stream	Location	Date Established
Belly River.....	N.W. 1-9-22-4	Aug. 31, 1911
Canyon Creek.....	N.E. 14-6-2-5	July 6, 1910
Cardwell Ditch.....	S.W. 31-8-1-5	July 11, 1912
Carmichael Ditch.....	S.E. 3-4-13-29-4	July 22, 1912
Connely Creek.....	S.E. 36-7-2-5	July 31, 1909
Cow Creek.....	N.E. 14-8-2-5	May 26, 1910
Crownest River.....	S.W. 12-8-5-5	July 28, 1910
do .....	N.E. 36-7-4-5	July 28, 1910
do .....	N.E. 26-7-2-5	Sept. 7, 1907
Elton Ditch.....	N.E. 19-8-1-5	July 10, 1912
Ford Ditch.....	N.E. 25-13-1-5	June 28, 1912
do .....	N.E. 26-13-1-5	June 28, 1912
Mill Creek.....	S.W. 18-6-1-5	July 7, 1910
Mosquito Creek.....	N.E. 30-16-28-4	Aug. 1, 1908
Muddypound Creek.....	S.W. 27-11-28-4	July 27, 1908
Nanton Creek.....	N.W. 20-16-28-4	Aug. 3, 1908
Oldman River.....	N.E. 34-7-1-5	Sept. 15, 1908
do .....	N.W. 10-9-26-4	July 12, 1910
Pincher River.....	N.E. 22-6-30-4	Aug. 13, 1906
Riley Ditch.....	S.W. 17-13-2-5	Aug. 1, 1912
Southfork River.....	S.E. 2-7-1-5	Aug. 5, 1909
St. Mary River.....	N.E. 22-7-22-4	Oct. 13, 1911
Summit Creek.....	S.W. 12-8-6-5	Feb. 21, 1912
Todd Creek.....	S.W. 19-8-1-5	Aug. 3, 1909
Trout Creek.....	S.E. 33-11-28-4	July 7, 1911
Willow Creek.....	S.E. 26-9-26-4	July 1, 1909

As this district had been thoroughly reconnoitred during previous years it was not necessary to establish any new stations on rivers or creeks during 1912. As, however, some of the smaller streams in the Crow's Nest Pass are being used for domestic and industrial water supplies it will probably be advisable to establish regular gauging stations on some of these during the coming year.

Miscellaneous gaugings were made of Blairmore Creek (Sec. 10-8-4-5), Fortier's Springs (Sec. 17-7-1-5), Gold Creek (Sec. 30-7-3-5), Lyon Creek (Sec. 26-7-4-5), McGillivray Creek (N.E. 7-8-4-5), Nez-Percé Creek (Sec. 17-8-4-5), Spring Creek (N.E. 27-13-29-4), Willow Creek (S.W. 36-12-28-4), and York Creek (N.W. 34-7-4-5), whenever possible.

Owing to the abundance of coal in this district power is not very expensive and water power has not been developed at all. There are no great power possibilities but there are good opportunities for developing a small amount of power very cheaply. One very serious drawback to water power development is the absence of suitable sites for reservoirs to store water to augment the winter flow.

Irrigation is not generally required in this district and the developments in that line are therefore not very great.

The gauges on the Riley and Ford Ditches were established by Charles Chambers, Inspector of Irrigation Works. As they are a long distance from the railway and are only occasionally in use, the district hydrographer did not visit them at all.

Winter records were taken of Belly River, Crownest River (three stations), Oldman River (two stations), Southfork River, St. Mary River and Summit Creek; Belly and St. Mary Rivers are included in the Cardston District during the winter months.

N. M. Sutherland, Grad. R.M.C., was in charge of the field work in this district until the sixth of May, when he was transferred to the survey party locating a canal from Belly River to the St. Mary River, and A. W. P. Lowrie, B.A. Sc., was placed in charge. Mr. Lowrie returned to the office about the end of November to make the final computations for this report and H. O. Brown, B.A. Sc., was in charge of the field work for the remainder of the year.

## SESSIONAL PAPER No. 25d

## CARDSTON DISTRICT.

This district included the following regular gauging stations:—

Stream	Location	Date Established
Belly River.....	N.E. 5-2-28-4	Nov. 1, 1911
do.....	S.E. 21-6-25-4	May 27, 1909
C.P.R. Canal.....	S.E. 21-2-24-4	July 26, 1910
Christianson Ditch.....	S.E. 12-3-28-4	Sept. 14, 1911
Crooked Creek.....	S.W. 22-2-29-4	Sept. 15, 1909
Fidler Ditch.....	S.E. 19-1-26-4	Sept. 13, 1911
Lee Creek.....	N.W. 10-3-25-4	June 28, 1909
Mami Creek.....	S.E. 19-2-27-4	Aug. 13, 1909
N.B. Milk River.....	N.E. 13-1-23-4	July 21, 1909
Milk River.....	N.E. 18-2-20-4	July 17, 1909
Rolph Creek.....	S.E. 21-2-24-4	May 17, 1911
St. Mary River.....	Sec. 25-1-25-4	By A.R. and I. Co. in 1905
Waterton River.....	N.E. 8-2-29-4	Aug. 26, 1908

As Mami Creek is of little importance no gauge observer was engaged, but discharge measurements were made regularly on each round of the hydrographer during the open water period. No gauge observer could be obtained for the North Branch of Milk River on the N.E.  $\frac{1}{4}$  Sec. 18, Tp. 2, Rge. 20, W. 4th Mer., but gaugings were made by the hydrographer whenever possible.

Miscellaneous discharge measurements were also made of St. Mary River (N.W. 11-3-25-4), Boundary Creek (S.E. 11-1-26-4), Cottonwood Creek (S.E. 21-2-29-4), Blakiston Brook (N.E. 30-1-29-4), Oil Creek (N.W. 23-1-30-4), Yarrow Creek (S.W. 15-4-29-4), Drywood River (N.W. 17-4-29-4), and Dryfork Creek (36-4-30-4), whenever possible.

In August, 1912, an arrangement was made with the United States Geological Survey by which regular gauging stations on St. Mary and Milk Rivers would in future be maintained jointly, each bearing half the cost of construction and maintenance. To get more accurate and satisfactory records it was decided to re-locate the stations at the best sites near the International Boundary and install automatic recording gauges. In August the Commissioner of Irrigation of Canada, and W. A. Lamb, District Engineer, U.S. Geological Survey, at Helena, Montana, met, went over the ground together, and decided upon the location, design and shelter for each gauge. The site chosen on St. Mary River is on the S.W.  $\frac{1}{4}$  Sec. 25, Tp. 1, Rge. 25, W. 4th Mer., and in October, V. Meek, of this Department, constructed a reinforced concrete shelter for the automatic recording gauge. A Friez Water Stage Register has been purchased for this station and will be installed at an early date.

The site chosen on the North Branch of Milk River is on the N.E.  $\frac{1}{4}$  Sec. 11, Tp. 1, Rge. 21, W. 4th Mer., and last October, V. Meek constructed a wooden shelter for the automatic recording gauge. A Stevens Continuous Water Stage Register has been purchased for this station and will be installed at an early date.

Winter records were taken at the regular stations on Belly River, Lee Creek, North Branch of Milk River (N.E. 13-1-23-4), St. Mary River, and Waterton River. The station on Belly River at Stand Off was included in the Macleod district during the winter months.

As there is considerable increment in the flow of Waterton River below the regular gauging station at Waterton Mills a regular gauging station will be established near its mouth as soon as a suitable site can be found.

There are only a few irrigation ditches in this district and the hydrographer therefore makes any inspections of these that are necessary. Unless urgent, they are usually made in the late summer or early fall when the streams are low and almost stationary, and need not be gauged as often as usual.

D. D. MacLeod, B.A. Sc., was in charge of the field work in this district until March 31, when he was relieved by L. J. Glesson, B.Sc., who was in charge until July 15, when he was transferred to a survey party in Saskatchewan. V. Meek, B.Sc., was in charge for the remainder of the year. J. E. Degnan and G. R. Elliott, B.A. Sc., made the final computations of the 1912 records and completed the 1911 records.

## MILK RIVER DISTRICT.

This district included the following regular gauging stations:—

Stream	Location	Date Established
Deer Creek.....	S.W. 15-1-12-4	May 26, 1911
Deer Creek Cattle Co. Ditch.....	S.W. 36-1-12-4	May 27, 1911
Hooper & Huckvale Ditch.....	S.W. 27-4-6-4	May 2, 1912
Manyberries Creek.....	S.W. 27-4-6-4 ①	June 17, 1910
Milk River.....	N.E. 21-2-16-4	May 18, 1909
".....	S.W. 35-1-13-4	Aug. 2, 1909
".....	S.W. 21-2-8-4	Aug. 5, 1909
".....	S.E. 3-1-5-4	Aug. 7, 1909
N.B. Milk River.....	S.W. 19-2-18-4	July 15, 1909
S.B. Milk River.....	N.W. 31-1-18-4	July 14, 1909

①—This station was originally on S. E. 3-5-6-4, but was moved to its present position on May 2, 1912.

The number of regular gauging stations in this district is comparatively small, but owing to shifting conditions at every one of them, it is necessary to make frequent gaugings in order to get reliable records, and as the distance between the stations is above the average the hydrographer cannot cover a larger district.

The arrangement with the United States Geological Survey also includes gauging stations on Milk River and the South Branch of Milk River in this district. The site chosen on Milk River is on N. E.  $\frac{1}{4}$  Sec. 6, Tp. 37, Rge. 9, E. Prin. Mer., in the state of Montana, and in November last J. E. Degnan, of this Department, constructed a wooden shelter for the automatic gauge. A Gurley Automatic Self-winding Water Stage Register has been purchased for this station and will be installed at an early date.

The site chosen on the South Branch of Milk River is at Croft's Ranch, on the Blackfoot Indian Reserve in Montana, and Mr. Lamb, of the United States Geological Survey, has constructed a wooden shelter, and has installed a Stevens Continuous Water Stage Register.

It was impossible to secure an observer for the gauge on the North Branch of Milk River on the S.W.  $\frac{1}{4}$  Sec. 19, Tp. 2, Rge. 18, W. 4th Mer., but discharge measurements were made at every opportunity.

Miscellaneous gaugings were made of Red Creek (Sec. 18-1-15-4), Police Coulee (Sec. 35-1-13-4), Deadhorse Coulee, (Sec. 4-2-11-4), Miners Coulee (Sec. 10-2-11-4), Halfbreed Creek (Sec. 28-2-10-4), Beargulch Creek (Sec. 19-2-9-4), Kennedy Creek (Sec. 3-1-5-4), Ketchum Creek (Sec. 21-4-6-4) Canal Creek (Sec. 6-4-6-4), South Branch of Manyberries Creek (Sec. 11-5-6-4), Lost River (Tp. 1-4-4), and Verdigris Coulee (Sec. 22-2-14-4), whenever possible.

Winter records were taken only at the gauging station on Milk River on the N.E.  $\frac{1}{4}$  Sec. 21, Tp. 2, Rge. 16, W. 4th Mer., which was included in the Cardston district during the winter months.

In this district, also, the hydrographer makes inspections of, and reports on, irrigation works. J. E. Degnan was in charge of the field work during the past year and also made the final computations for the annual report. He was assisted in the field and office by R. J. Srigley.

#### WESTERN CYPRESS HILLS DISTRICT.

This district included the following regular gauging stations:—

Stream	Location	Date Established
Anderson Ditch.....	S.W. 23-6-3-4	Sept. 23, 1911
Battle Creek.....	N.E. 33-5-29-3	June 3, 1909
do.....	N.W. 33-5-27-3 ①	July 5, 1910
do.....	N.E. 3-3-27-3	May 10, 1910
Bullshead Creek.....	N.W. 15-9-5-4	Oct. 9, 1911
Cheeseman Ditch.....	S.W. 12-8-29-3	June 24, 1911
Gaff Ditch.....	S.W. 25-5-29-3	July 11, 1911
Gap Creek.....	N.E. 31-11-26-3	May 3, 1910
do.....	S.E. 4-10-27-3	April 25, 1910
Gilchrist Ditch.....	S.W. 11-5-27-3	Oct. 16, 1911
Grosventre Creek.....	S.E. 27-9-4-4	Oct. 10, 1911
Lindner Ditch.....	N.W. 10-6-29-3	July 26, 1910
Lodge Creek.....	S.E. 12-1-29-3	Aug. 13, 1909
do.....	N.E. 36-3-1-4	Aug. 31, 1912
do.....	N.W. 10-6-3-4	July 22, 1909
E.B. Lodge Creek.....	S.E. 1-7-3-4	Oct. 7, 1911
E.B. Mackay Creek.....	N.W. 36-10-1-4	Oct. 13, 1911
W. B. Mackay Creek.....	N.W. 27-10-1-4 ②	Oct. 12, 1911
Maple Creek.....	N.E. 16-11-26-3	May 9, 1908
do.....	S.E. 28-11-26-3	May 4, 1910
Marshall & Gaff Ditch.....	N.E. 33-5-29-3	July 11, 1911
McShane Creek.....	S.W. 3-10-27-3	Apr. 23, 1909
McKinnon Ditch.....	N.W. 20-4-26-3	Oct. 20, 1911
Middle Creek.....	S.W. 35-5-1-4	June 21, 1910
do.....	S.W. 30-5-29-3	July 20, 1909
do.....	N.W. 4-2-29-3	June 13, 1910
Oxart Creek.....	N.E. 20-6-27-3	June 15, 1909
Richardson Ditch.....	S.E. 2-5-27-3	Oct. 14, 1911
Ross Creek.....	N.W. 24-9-3-4	Oct. 11, 1911
Sage Creek.....	N.E. 9-1-2-4	Aug. 10, 1909
Sixmile Coulee.....	S.W. 6-7-28-3	July 4, 1911
Spangler Ditch.....	S.W. 6-7-28-3	July 10, 1911
Starks & Burton Ditch.....	S.E. 17-11-5-4	Oct. 9, 1911
Stirling & Nash Ditch.....	Sec. 22-3-27-3	July 11, 1911
Tenmile Creek.....	S.E. 4-6-29-3	July 21, 1909
White Ditch.....	S.W. 1-9-27-3	June 15, 1911

①—This station was originally on the S. W. 2-6-28-3, but was moved to its present position on May 29, 1912.

②—This station was originally on the S. W. 23-10-2-4, but was moved to its present position on Sept. 12, 1912.

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In order to get more complete records of the flow of Lodge Creek a new station was established on the N.E.  $\frac{1}{4}$ , Sec. 36, Tp. 3, Rge. 1, W. 4th Mer., which is above the larger ditches diverting from the main branch of Lodge Creek. No other changes of importance were made in the district except that the location of one of the gauges on Battle Creek had to be changed as shown above so that an observer could be secured.

Miscellaneous gaugings were made of Battle Creek (Sec. 16-2-25-3 and N.W. 21-7-29-3), Cypress Creek (S.E. 6-9-27-3), Middle Creek (N.E. 23-5-30-3 and N.W. 15-3-29-3), McShane Creek (N.E. 2-9-27-3), Piegan Creek (S.E. 28-7-4-4), and Spring Coulee (N.W. 22-6-1-4), whenever possible.

Many of the ditch owners do not realize the value of records of the water used by them, and it has therefore been impossible to get good records on the ditches, but these will gradually improve, for, as irrigation increases, the irrigator will find the records very useful and will be only too glad to co-operate with the Department in taking them.

This district includes a great many regular gauging stations on very small streams, but as every bit of available water will eventually be used for irrigation purposes, records on these are valuable.

While this is a rather large driving district, it can be covered satisfactorily except during the spring time. There is usually quite a large snow-fall in the hills during the winter and this usually runs off very quickly when spring opens up and the streams become quite high for a short time. Sometimes rains follow and keep the flow up, but not always, and the irrigators depending on high water and flood discharge of the stream should fill their reservoirs at the first opportunity. The records during early spring are therefore of considerable importance, but as the freshets are of short duration and travelling is difficult at that time, it is impossible for one hydrographer to cover the district properly. The hydrographer should be in the field on or shortly after the middle of March. This has not always been possible, owing to the fact that the fiscal year ends on the 31st of March and funds were not available. Provision should therefore be made in future estimates so that two hydrographers can be placed in this district during the spring and so that they can start field work about the middle of March.

Winter measurements would be of little value in this district and none have therefore been taken.

C.R. Elliott, B.A. Sc., was in charge of the field work in this district and made the final computations for the annual report.

## EASTERN CYPRESS HILLS DISTRICT.

This district included the following regular gauging stations:—

Stream	Location	Date Established
Axton Ditch.....	N.E. 23-7-21-3	Aug. 12, 1911
Bear Creek.....	S.E. 18-11-23-3	June 22, 1908
E.B. Bear Creek.....	S.W. 32-10-23-3	Aug. 18, 1909
W.B. Bear Creek.....	S.E. 21-10-23-3	Aug. 16, 1909
Belanger Creek.....	S.W. 18-7-25-3	June 12, 1909
do.....	S.W. 30-6-25-3	Mar. 31, 1912
E.B. Beveridge Ditch.....	N.E. 7-10-24-3	June 9, 1911
W.B. do.....	N.E. 18-10-24-3	June 5, 1911
Bone Creek.....	N.W. 34-8-22-3	July 2, 1908
Braniff Ditch.....	S.E. 30-11-23-3	July 22, 1911
Bridge Creek.....	N.E. 11-11-22-3	July 29, 1909
do.....	S.E. 33-10-22-3	Apr. 29, 1911
Cross Ditch.....	N.W. 15-7-22-3	Sept. 9, 1911
Davis Creek.....	N.E. 29-6-25-3	May 24, 1909
Dimmock Ditch.....	S.E. 16-11-21-3	July 29, 1912
Fairwell Creek.....	N.W. 30-6-24-3	June 10, 1909
Fearon & Moorehead Ditch.....	N.E. 29-10-22-3	July 6, 1911
do do.....	N.E. 33-10-22-3	July 4, 1911
do do.....	S.E. 33-10-22-3	July 6, 1911
Frenchman River.....	N.E. 31-6-21-3	July 31, 1908
do.....	N.E. 23-6-23-3	July 9, 1912
do.....	N.E. 16-6-24-3	July 10, 1912
N.B. Frenchman River.....	N.E. 16-7-22-3	July 25, 1908
Hay Creek.....	N.E. 30-10-25-3	Apr. 22, 1909
do.....	S.W. 29-10-25-3	July 4, 1910
Jones Coulee.....	S.E. 20-8-20-3	May 15, 1912
Jones Coulee.....	S.E. 5-8-20-3	Sept. 23, 1909
Lonepine Creek.....	N.W. 27-7-26-3	July 17, 1909
Moorehead Ditch.....	N.W. 25-10-25-3	June 10, 1911
Morrison Ditch.....	S.W. 26-6-21-3	Aug. 22, 1911



Needham Ditch.....	S.W. 30-11-23-3	June 22, 1911
Piapot Creek.....	N.E. 18-11-24-3 ①	June 17, 1908
Pollock Ditch.....	N.W. 22-7-21-3	Aug. 10, 1911
Rose Creek.....	N.E. 26-7-22-3	May 2, 1911
Skull Creek.....	N.W. 10-11-22-3	June 29, 1908
do.....	N.E. 29-10-22-3	Apr. 8, 1911
Sucker Creek.....	N.W. 24-6-26-3	May 26, 1909
Swiftcurrent Creek.....	S.W. 22-7-21-3	May 18, 1909
do.....	Sec. 17-10-19-3	May 27, 1910
do.....	Sec. 18-10-19-3	June 15, 1910
Strong & Day's Ditch.....	N.E. 25-6-22-3	July 31, 1908

As the records had not been altogether satisfactory at the old gauging station on Belanger Creek, a new gauging station was established farther downstream, but owing to some changes in the ownership of the ranch, the gauge at the new station was not read continuously. The two new gauging stations on Frenchman River above East End were finished and put in good shape in July, and the records on this stream will in future be more complete and satisfactory.

Miscellaneous gaugings were made of Barnett Ditch (Sec. 17-7-22-3), Blacktail Creek (N. W. 30-6-23-3), Calf Creek (Sec. 5-8-22-3), Concrete Coulee (Sec. 11-7-23-3), Cross Ditch (Sec. 5-8-22-3), Dimmock Creek (Sec. 10-11-21-3), Doyle Coulee (Sec. 17-7-23-3), Frenchman River (N.E. 21-5-17-3 and N.E. 22-6-25-3), Maple Creek Water Main (N.W. 20-10-25-3), Overflow of Maple Creek Water-works Reservoir (N.W. 20-10-25-3), Saunders' Springs (Sec. 20-10-25-3), and a Spring Creek on S.W. 7-6-16-3, whenever possible.

Beaver dams have become so numerous on some of the streams in this district that it is difficult to get satisfactory records of the flow.

Provision should be made so that two hydrographers can be placed in this district also during the spring, and so that they can start field work on or shortly after the middle of March.

Winter records would be of little value in this district and none have therefore been taken.

G. H. Whyte was in charge of the field work in this district until May 10, when he was transferred to the Battleford district. J. S. Wright, Grad. R.M.C., was then placed in charge of this district and finished the field work and made the final computations for the annual report.

#### MOOSE JAW DISTRICT.

This district included the following regular gauging stations:—

Stream	Location	Date Established
Boxelder Creek.....	N.E. 2-12-30-3	May 24, 1909
Bridge Creek.....	S.E. 23-13-19-3	Mar. 29, 1911
Bullshead Creek.....	Sec. 16-12-5-4	July 26, 1909
Long Creek.....	S.E. 10-2-8-2	June 22, 1911
Mackay Creek.....	N.W. 26-11-1-4	July 29, 1909
Moosejaw Creek.....	N.W. 16-16-26-2	Apr. 7, 1910
do.....	N.W. 14-15-25-2	Apr. 13, 1910
do.....	N.W. 19-11-18-2	June 21, 1911
Qu'Appelle River.....	S.W. 33-19-21-2	May 12, 1911
Ross Creek.....	N.W. 31-11-2-4	July 28, 1909
Sevenpersons River.....	N.E. 30-12-5-4	Apr. 27, 1910
Souris River.....	N.E. 11-2-8-2	June 23, 1911
do.....	N.E. 36-2-1-2	June 26, 1911
do.....	Sec. 6-4-26-1	July 20, 1911
South Saskatchewan River.....	N.W. 31-12-5-4	May 31, 1911
Swiftcurrent Creek.....	S.W. 30-15-13-3	Apr. 30, 1910

The number of regular gauging stations in this district is comparatively small, but owing to the long distances between gauging stations and the importance of some of these it is impossible to increase the number. It has, however, been found that records of Moose Jaw Creek on the N.W. ¼ Sec. 14, Tp. 15, Rge. 25, W. 2nd. Mer. are of little value and this station will be abandoned. If a suitable site can be found near the eastern boundary of Saskatchewan another gauging station will be established on Qu'Appelle River.

Miscellaneous gaugings were made of Thunder Creek at Moose Jaw whenever possible.

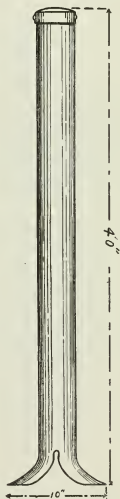
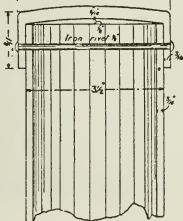
There are now eight dams on Moose Jaw Creek in connection with domestic and industrial water supplies, and at least one other is contemplated. There is also about the same number of dams on Souris River. Though small and of an inferior quality, the water supply from these streams is very valuable. In order to intelligently administer the regulations and deal with new applications for water supply it is absolutely necessary to obtain continuous records of the flow of these streams at different points, and they are therefore being given special attention.

①—This station was originally located on S. W. 17-11-24-3, but was moved to its present location on May 13, 1909.

DEPT. OF THE INTERIOR  
IRRIGATION OFFICE  
PLAN  
OF  
PERMANENT IRON BENCH MARK



*Half Size*





## SESSIONAL PAPER No. 25d

Winter records were taken only on Moose Jaw Creek near Moose Jaw, Qu'Appelle River at Lumsden, and South Saskatchewan River at Medicine Hat during January, February, and March, but were also obtained on Souris River at Estevan, and Swiftcurrent Creek at Swift Current in December. The station at Medicine Hat was included in the Macleod district, and the others in the Battleford district during January, February and March, but in December were a part of the new Moose Jaw district, which includes part of the old Battleford district.

D. D. McLeod, B.A.Sc., was in charge of the field work in this district during April and May, and H. D. St. A. Smith, Grad. R.M.C., was in charge after June 12. Mr. Smith also made the final computations for this report.

## BATTLEFORD DISTRICT.

This district included the following regular gauging stations:—

Stream	Location	Date Established
Battle River.....	S.E. 19-43-16-3	June 17, 1911
Red Deer River.....	S.E. 20-38-27-4	Dec. 2, 1911
North Saskatchewan River.....	N.W. 33-52-24-4	May 14, 1911
" " "	N.E. 29-43-16-3	May 18, 1911
" " "	River Lot No. 76	
	Prince Albert	Oct. 2, 1911
South Saskatchewan River.....	S.W. 28-36-5-3	May 27, 1911

While there was no immediate use for records on the streams in this district when it was first started, the records are now of very great value to the Department of Public Works of Canada in their study of the North Saskatchewan River for navigation purposes, also to the Water Power Branch of this department and others interested in power development. There will be a good market for power in central Alberta, and many parties have been investigating the favourable water power sites and are awaiting records of the flow of the streams west and north of Edmonton.

J. C. Keith, B.A.Sc., was in charge of the field work in this district during January and February and H. J. Duffield, B.E., was in charge during March and April. G. H. Whyte was then in charge until the end of the year and with R. H. Goodchild made the final computations for this report.

During the fall Mr. Whyte did some reconnaissance work west of Edmonton, but as he could not leave the regular district, except for short periods, he could not go far from the railway.

During the winter almost continuous records were taken at all the regular gauging stations in this district. Those at Battleford, Prince Albert and Saskatoon were included in the new Moose Jaw district during December and the remainder in a new district called the Edmonton district. The Edmonton district included Red Deer River at Red Deer, North Saskatchewan River at Edmonton, and Athabasca River and its tributaries. As this new district was not formed until after freeze up and observers are very scarce, no regular gauging stations were established on Athabasca River, but a number of miscellaneous gaugings of this stream were made.

During the year miscellaneous gaugings were made of A-la-pache River (Tp. 57-5-6), Baptiste River (Tp. 56-3-6), South Branch of Baptiste River (Tp. 54-2-6), West Branch of Baptiste River (Tp. 56-3-6) Beaverdam River (Tp. 48-21-5), Dummy Creek (Sec. 33-48-21-5), Embarras River (Sec. 33-48-21-5), Hay River (Tp. 53-27-5), Lobstick River (S.W. 29-53-7-5), McLeod River (Tp. 48-21-5), N.W. 5-52-18-2 and Sec. 33-52-17-5), West Branch of McLeod River (Tp. 49-23-5), Miette River (Tp. 47-1-6), Pembina River (S.W. 20-53-7-5), Pintohorse Creek (Tp. 54-27-3), Prairie Creek (N.W. 5-51-25-5), Rocky River (near Jasper House), and Stony River (near Jasper House).

While in charge of the field work, Mr. Whyte collected considerable data concerning the largest floods on the North Saskatchewan River at Edmonton and Prince Albert, and made estimates of the maximum discharge. The results of his investigations are given in the description of the North Saskatchewan River drainage basin.

## RATING CURRENT METERS.

The rating station was kept in operation from early in May until the end of October. During this period all the meters used in the field during 1912 were rated at least once and most of them were rated twice. The meters rated for this office were as follows:—

12 W. & L. E. Gurley Current Meters, Pattern No. 600	
2 " " " " No. 617	
9 " " " " No. 618	
15 " " " " No. 623	

In addition to these the following were rated:—

- 4-W. & L. E. Gurley Current Meters, Pattern No. 623, for the British Columbia Railway Belt Hydrographic Survey.
- 3-W. & L. E. Gurley Current Meters, Pattern No. 623, for the Manitoba Hydrographic Survey.
- 1-W. & L. E. Gurley Current Meter, Pattern No. 600, for the Department of Public Works of Canada.
- 1-W. & L. E. Gurley Current Meter, Pattern No. 621, for the Department of Public Works of Canada.
- 1-W. & L. E. Gurley Current Meter, Pattern No. 623, for the United States Geological Survey.
- 1-W. & L. E. Gurley Current Meter, Pattern No. 618, for the United States Department of Agriculture.
- 1-W. & L. E. Gurley Current Meter, Pattern No. 600, for the Canadian Pacific Railway Company.
- 2-W. & L. E. Gurley Current Meters, Pattern No. 617, for the Canadian Pacific Railway Company.
- 1-Haskell Current Meter, for C. Cumming, Civil Engineer of Crow's Nest, B.C.

In all fifty-three current meters were rated, thirty-eight for this office and fifteen for other parties. The U. S. Geological Survey meter was rated in order to make a comparison of our rating with the rating of the same meter by the U. S. Bureau of Standards. The U. S. Department of Agriculture meter was rated in order to make a comparison of our rating with the rating of the same meter by E. J. Hoff at a circular rating station at Berkeley, California, U.S.A. It is very pleasing to know that the ratings were practically the same, and that this rating station is considered one of the best in existence.

All the meters were rated by H. O. Brown, B.A.Sc., and an interesting article on Current Meter Rating, written by Mr. Brown at the close of the season, is attached to this report as an appendix.

As explained by Mr. Brown, the recording apparatus while very good, is not as nearly perfect as that used by the United States Bureau of Standards, and arrangements have therefore been made to have this office rating station equipped with similar apparatus at an early date.

#### BENCH MARKS.

When the stream measurement work was first started, the gauges were usually referred to a bench mark on a wooden stake or stump of a tree. These were easily shifted or destroyed and were not satisfactory. In 1911, an iron bench mark of the type used by the United States Geological Survey was adopted by this office, and was established at sixty-two regular gauging stations. During the past year, about forty-five more were established and now almost all the gauges are either referred to a bench mark on a concrete pier or other permanent structure, or to one of these iron bench marks. Whenever an opportunity is afforded these are tied to the Canadian Pacific Railway or Dominion Government levels, to determine their elevation above sea level, and are therefore also a convenient reference for local levelling operations.

Plate No. 2 shows the type and details of the permanent iron bench mark which is used. It is made of a piece of three and a half inch wrought iron pipe which is split at the bottom and expanded to a width of ten inches in order to anchor the tube solidly in the ground. The top is covered by a cap cast out of brass, or preferably aluminum bronze (10% Al. and 90% Cu.), which is secured to the top of the pipe by a long iron rivet. The inscription on the cap is cast in sunk-in letters giving a smooth surface to the cap. All the exposed surfaces of the iron pipe are given a good coat of a first quality rust-resisting paint, and the bench mark is set with six inches projecting above the ground.

The brass cap for the iron bench mark may be modified and made with a stem about three inches long projecting on the under side which can be cemented into a drill hole in solid rock or masonry, to form a permanent and convenient bench mark.

#### OFFICE WORK.

As above intimated, the reports of the gauge height observers and the hydrographers are transmitted to the office by postal cards. These are copied to office forms and filed in a cabinet, which is carefully indexed and where they can be referred to at any time without trouble. As the engineers complete their computations, the results are entered on convenient forms and filed in the same cabinet.

A cabinet made up of four styles of drawers is used for filing the records. The top section is used for filing the gauge height books of the observers and the current meter note books of the hydrographers. The gauge height books are filed alphabetically according to the names of the gauging stations, while the current meter note books are filed alphabetically, according to the names of the hydrographers. The next section contains the postal cards sent in by the observers and the hydrographers. Both of these are filed alphabetically, according to the names of the gauging stations. The third section is made up of map drawers and contains the gauge height-area, gauge height-mean velocity and gauge height-discharge curves, and plotted cross-sections which are filed alphabetically, according to the names of the gauging stations. The same section contains the maps showing the outlines of the drainage basins, filed numerically, according to the number of the sectional sheet. The rating curves for the current meters are also filed in this

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section numerically, according to the office numbers of the meters. The bottom section of the cabinet consists of letter size pockets, alphabetically arranged for each gauging station. The tables of gauge heights, discharge measurements, daily gauge height and discharge, monthly discharge, a description of the station, and memos of any changes are filed in these pockets. The different rating tables for each meter are also filed numerically in this section and another drawer contains the monthly reports of the meteorological service.

The copying and filing of the reports of the gauge height observers and the hydrographers is entrusted to the office recorder. While doing this he must carefully examine all records to see that there are no errors, and where there are doubtful or impossible records it is his duty to have the data corrected or ascertain the cause of the unusual condition. He also makes out the pay list for the observers and conducts the correspondence relating to the records.

All computations are checked before being used or published. For this reason, as far as possible, men with some technical education, or students in science, are engaged as helpers. The gaugings are computed by the helper and his work is checked by the hydrographer. In some instances where there is a great deal of driving and camping out, the hydrographer cannot secure a helper who can compute discharges, and in that case he computes the discharges himself and his computations are checked in the office.

Gaugings of the flow under ice are usually made by using the multiple point method, and vertical velocity curves have to be plotted to determine the mean velocity in the vertical. The computation by this method is long and tedious and cannot be done by the hydrographer in the field. There are therefore a great many computations to be made in the office and the services of a computer are required.

During the year 1912, G. H. Nettleton filled the position of office recorder and J. B. Gray that of office computer.

There has been a slight tendency in the past to make a big showing in the field work and to overlook the importance of the office work. Sufficient staff should be provided to thoroughly check all the reports and field books as they are received and plot the results on the gauge height-area, gauge height-velocity, and gauge height-discharge curves at once. Discrepancies in the records will then be discovered at an early date and the office will be able to keep a better check on the results and direct the work much more intelligently. Usually the district hydrographers are young and somewhat inexperienced engineers and do not always realize the importance of some of the minor details of the work. The greater part of the Chief Hydrographer's time is now spent on irrigation work and he can only exercise a very general supervision over the work. It has therefore become necessary to strengthen the office staff by the appointment of two assistants to the Chief Hydrographer, who will, in addition to performing the duties of office engineers, act also as field inspectors. These men, it is expected, will make a special study of hydrology and stream measurements and by constantly checking up the field and office work bring it up to a much higher degree of accuracy.

G. H. Whyte has acted as First Assistant to the Chief Hydrographer since the first of January, 1913. During this time he has been in charge of the office work and assisted in compiling the Annual Report.

G. R. Elliott is to be the Second Assistant during the coming year.

## CONVENTIONS AND CONFERENCES.

In August last the Chief Hydrographer attended a convention of the Western Canada Irrigation Association at Kelowna, B.C., as a delegate for the Canadian Society of Civil Engineers and the Calgary Board of Trade.

The papers read at this convention were very interesting and instructive. Several resolutions of interest to this office, but more particularly relating to conditions in British Columbia, were passed. At the close of the convention the delegates were shown over some irrigated orchards and gardens in the vicinity of Kelowna and Penticton.

In January last, the Chief Hydrographer attended a conference of District Engineers of the Water Resources Branch of the United States Geological Survey, as representative of this office. It was held at the head office of the survey in Washington, D.C., and was attended by M. O. Leighton, Chief Hydrographer of the U.S. Geological Survey, J. C. Hoyt, Engineer in charge of Surface Water Investigations, all the District Engineers of the Water Resources Branch, a number of Assistant Engineers, a representative of the U.S. Bureau of Standards, and five representatives from Canada. The Canadian representatives were A. V. White and L. G. Denis, of the Conservation Commission, H. G. Acres, of the Ontario Hydro Electric Power Commission, D. L. McLean, of the Water Power Branch of the Department of the Interior, and the writer. The papers and discussions covered the subject of stream measurement very fully, and were very instructive. One could not help but note the interest every delegate took in the subjects taken up.

While papers were not assigned to the Canadian representatives, they took part in the discussions and were given the same consideration as the District Engineers of the Water Resources Branch, and the conference was always glad to hear how the work was being done in Canada.

The writer considers himself very fortunate in having had the opportunity to attend this conference, and would recommend that should invitations be received to attend any more such conferences, representatives should be sent.

A report of the conference was submitted some time ago, but as it deals more particularly with details of engineering and administrative work, it is not attached for publication.

On the 26th instant, advantage was taken of the fact that all the engineers of this office employed on stream measurement work were in headquarters, to hold a conference. Considering the short notice given and that Easter holidays came in between the papers were very satisfactory. Many important points were brought out in the papers and discussions. It also gave the Commissioner an opportunity to explain to and instruct the hydrographers in many matters which might otherwise have been overlooked or only given to a few.

It is hoped that another conference will be held next winter and that other branches of the government and other organizations doing stream measurement work will be invited to send representatives.

#### FUTURE WORK.

The stream measurement work will be continued during the coming year in all the old districts; and every effort will be made to extend the territory covered, but the scope of the work is, of course, limited by the appropriation and staff available.

There are a number of important streams which rise in the mountains west of the Calgary and Edmonton Branch of the Canadian Pacific Railway. With the advent of railways, industries will soon be started in this district and the water supply will be an important factor. During the coming year it is proposed to have a hydrographer make a thorough reconnaissance of this district and make a study of the water supply, particularly to get records of the flow of the North Saskatchewan River and its tributaries. No doubt there are possibilities of water power development in this district, and records of stream flow will be wanted.

During the past year some information has been secured regarding the flow of Athabasca, McLeod and Pembina rivers. It will be impossible to secure observers wherever desired, but it is hoped during the coming year to make a careful reconnaissance of Athabasca River and its tributaries and establish regular gauging stations wherever the value of the records will warrant the expense of obtaining them. As elsewhere, our investigations in this district during the past year show that the minimum flow which occurs during the winter is much below the general expectation, and as there are a large number of possible power sites on this stream winter records are of much value, and special efforts will be made to get records at the more important points during next winter.

Fortunately, excessive floods do not occur very frequently on the streams in Alberta and Saskatchewan, but, nevertheless, it is most important that these should not be under-estimated when designing dams, headgates, bridges, and other works on the streams. Not only does their destruction cause heavy loss to the owners of the structures but the lives and property of many other people are endangered. As above intimated, special studies of the maximum floods on Bow and North Saskatchewan Rivers at certain points were made during the past year. In future this subject will be given special attention, all available data will be collected, and the estimates tabulated in convenient form for use in designing structures at different points on each large stream.

I do not think it necessary to elaborate on the importance of continuing observations during the winter on the more important streams where power possibilities exist, but it might not be amiss to refer to the importance of studying the winter flow of some of the smaller streams in the more thickly populated districts. Domestic and industrial water supplies have been installed to take their supply from streams which, judging from their open water flow, would provide an ample supply at all times. In several instances water-works have been installed without sufficient knowledge of the winter flow, with the result that the supply proved to be inadequate during the winter. When the supply is from open streams this can very often be overcome by creating storage reservoirs at a nominal cost, but in cases where the supply is from springs there is seldom any remedy. As many of the towns on the prairie are dependent for their water supply on streams with very small flow during the winter months, it is most important that they should know before designing their works exactly what that flow is, so that the scheme will include the necessary storage facilities. The railways are also becoming perplexed as to how to get enough water in some localities to operate their trains during the winter months and during the past winter had, in some instances, to haul water for very long distances, owing to the failure of their water supply at certain tanks. Records of the discharge of all the streams in these localities, even though very small, are very valuable during both summer and winter.

Many engineers make their estimates of stream flow from precipitation records. It should, however, be pointed out that precipitation records gathered at a few isolated points are of very little value in estimating the probable discharge of the streams in Alberta and Saskatchewan and very often are misleading. The physical features and the precipitation are so varied within the same drainage basin that no reliable estimates can be made. Streams, such as Bow River, for instance, very often have a comparatively large run-off during a comparatively hot, dry summer, due to the fact that a much larger quantity of snow and ice is melted in the mountains in a hot, dry summer than in a cold wet summer. In a cold wet summer the precipitation in the mountains often falls as snow and is stored instead of coming down to still further swell the already high streams. This same condition is found on the North Saskatchewan and all other large streams whose main sources are in the

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mountains. It is, for instance, impossible to estimate the probable discharge of the North Saskatchewan River at Prince Albert from precipitation records and the only reliable data to use are the records of stream flow.

To arrive at anything approaching a reliable estimate of the flow of a stream at different stages and the duration of those stages, a series of continuous records of discharge extending over a considerable period is absolutely necessary. George W. Rafter, in Water Supply Paper No. 80, published by the United States Geological Survey, says:

"Further, it can be stated that for records from twenty years to thirty-five years in length the error may be expected to vary from 3.25 per cent. down to 2 per cent., and that, for the shorter periods of five, ten and fifteen years the probable extreme deviation from the mean would be 15 per cent., 8.25 per cent., and 4.75 per cent. respectively."

Mr. Rafter says, further, that with less complete records

"Mr. Henry reached the conclusion that at least 35 to 40 years' observations are required to obtain a result that will not depart more than  $\pm 5$  per cent. from the true normal. The average variation of a 35-year period was found to be  $\pm 5$  per cent., and for a 40-year period  $\pm 3$  per cent."

The records of this office do not extend over a period of more than five years on any stream, and during that period interruptions have occurred, due to lack of funds and staff. Proper provision should be made so that this work will not in future be subject to these interruptions.

The water supply is one of the most important resources of a country, and an accurate knowledge of the flow of water in nearly all important streams is essential for the solution of many problems in connection with navigation, water-power, irrigation, domestic and industrial water supplies, sewage disposal, mining, bridge building, river-channel protection, flood prevention, and storage for conservation of flood waters. The records of this office are being used quite extensively now by engineers and the field of operations should be extended to include other parts, if not the whole of Canada.

## DEFINITIONS.

The volume of water flowing in a stream is known as run-off or discharge. In expressing it various units are used, depending upon the kind of work for which the data are needed. Those used in this report are "Second-foot," "acre-foot," "run-off per square mile" and "run-off in depth in inches" and may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second and is the body of water flowing in a stream one foot wide and one foot deep at the rate of one foot per second.

The "acre-foot" is the unit capacity used in connection with storage for irrigation work, and is equivalent to 43,560 cubic feet. It is the quantity required to cover an acre to a depth of one foot.

The expression "second-feet per square mile" means the average number of cubic feet of water flowing each second from every square mile of drainage area on the assumption that the run-off is uniformly distributed.

"Depth in inches" means the depth of water in inches that would have covered the drainage area, uniformly distributed, if all the water could have accumulated on the surface. This quantity is used for comparing run-off with rain-fall, which quantity is usually given in depth in inches.

It should be noticed that "acre feet and depth in inches" represent the actual quantities of water which are produced during the periods in question, while "second-feet," on the contrary, is merely a rate of flow per second.

## EXPLANATION AND USE OF TABLES.

The data obtained and the estimates made therefrom have been compiled in tabulated form and for each regular gauging station are given, as far as available, the following data:—

1. Description of station.
2. List of discharge measurements.
3. Table of daily gauge heights and discharges.
4. Table of monthly discharges and run-off.

The description of stations gives such general information about the locality and equipment as would enable the reader to find and use the station. It also gives, as far as possible, a complete history of all the changes that have occurred since the station was established and that might affect the records in any way.

The list of discharge measurements gives the results of all the discharge measurements that have been made at or in the vicinity of the gauging station or have been used in completing the records for the gauging station. It gives the date on which the measurement was made, the name of the hydrographer, the width and area of cross-section, the mean velocity of the current, the gauge height and the discharge in second feet.



The table of daily gauge heights and discharges given in this report is a combination of two tables kept in the office of the survey, namely the table of daily gauge heights and the station rating table. The table of daily gauge heights gives the daily fluctuations of the surface of the water above the zero of the gauge, as reported by the observer. During high water, two observations of the gauge were made at some stations and the gauge height given in the table is the mean of the observations for the day. The discharge measurements and gauge heights were the base data from which the other tables are computed. The table of daily discharges is the discharge in second-feet, corresponding to the stage of the stream, as given by the station rating table.

In the table of monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gauge height was highest. As the gauge height is the mean for the day, there might have been short periods when the water and the corresponding discharge were greater than given in this column. Likewise, in the column "Minimum" the quantity given is the mean flow for the day when the mean gauge height was lowest. The column headed "Mean" is the average flow for each second during the month. The computations for the quantities in the remaining columns have been based upon this mean. The drainage area for each gauging station was marked off on the sectional maps of the Department and the area taken off with a planimeter. In many districts, information regarding topographical features is very incomplete and the computed areas are only approximate. As the surveys of the Department are extended and completed these computations will be checked and, if necessary, corrected.

#### CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:—

- 1 cubic foot equals 6.23 British Imperial gallons.
- 1 cubic foot equals 7.48 United States gallons.
- 1 acre equals 43,560 square feet; equals 4,840 square yards.
- 1 acre-foot equals 43,560 cubic feet.
- 1 acre-foot equals 271,472 British Imperial gallons.
- 1 acre-foot equals 325,850 United States gallons.
- 1 inch deep on 1 square mile equals 2,323,200 cubic feet.
- 1 inch deep on 1 square mile equals 0.0737 second-feet per year.
- 1 second-foot equals 6.23 British Imperial gallons per second; equals 373.8 gallons per minute; equals 538,272 gallons for one day.
- 1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,272 gallons for one day.
- 1 second-foot equals about 1 acre-inch per hour.
- 1 second-foot for one day equals 1.983 acre-feet.
- 1 second-foot for one 28-day month equals 55.54 acre-feet.
- 1 second-foot for one 29-day month equals 57.52 acre-feet.
- 1 second-foot for one 30-day month equals 59.50 acre-feet.
- 1 second-foot for one 31-day month equals 61.49 acre-feet.
- 1 second-foot for 153 days equals 303.47 acre-feet.
- 1 second-foot for one year equals 724 acre-feet.
- 1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
- 1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
- 1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
- 1 second-foot for one day-31 month covers 1 square mile 1.153 inches deep.
- 1 second-foot for 153 days covers 150 acres 24.278 inches or 2.023 feet deep.
- 1 second-foot for one year covers 1 square mile 13.572 inches or 1.131 feet deep.
- 100 British Imperial gallons per minute equals 0.268 second-feet.
- 100 United States gallons per minute equals 0.223 second-feet.
- 1,000,000 British Imperial gallons per day equals 1.86 second-feet.
- 1,000,000 United States gallons per day equals 1.55 second-feet.
- 1,000,000 British Imperial gallons equals 3.68 acre-feet.
- 1,000,000 United States gallons equals 3.07 acre-feet.
- 1,000,000 cubic feet equals 22.95 acre-feet.
- 1 foot per second equals 0.682 miles per hour.
- 1 cubic foot of water weighs 62.5 pounds.
- 1 horse-power equals 550 foot-pounds per second.
- 1 horse-power equals 746 watts.
- 1 horse-power equals 1 second-foot falling 8.80 feet.
- 1  $\frac{1}{2}$  horse power equals 1 kilowatt.

To calculate water power quickly:  $\frac{\text{sec. ft.} \times \text{fall in feet}}{11} = \text{net horsepower on water wheel, realizing 80 per cent of the theoretical power.}$

To find the number of acre-feet required for a certain acreage under the prescribed duty of water of one hundred and fifty acres for each cubic foot of water per second flowing continuously during the irrigation season (153 days), multiply the acreage by 2.02314.

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1 British Columbia miners' inch equals 1.68 cubic feet per minute or 1 second-foot approximately equals 35.7 British Columbia miners' inches.

## METHODS OF MEASURING STREAM FLOW.

There are three distinct methods of determining the surface flow of streams: (1) By measurements of slope and cross-section and the use of Chezy's and Kutter's formulae; (2) by means of weirs, which include any device or structure that by measuring the depth on a crest or sill of known length and form, the flow of water may be determined; (3) by measuring the velocity of the current and the cross-section. The third method is the one most commonly used by this survey. The second is used when the flow is too small to be accurately determined by the third, while the first is only used in making estimates of the discharge of a stream when the only data available are the cross-section and slope.

**SLOPE METHOD OF DETERMINING DISCHARGE.**—The slope of a stream, or rather of a section of a stream, is the difference in elevation between the upper and lower ends of the section, commonly called the fall, divided by the distance or the length of the section. Slope sections vary in length from two or three hundred feet to several hundred feet, depending largely upon the nature of the stream.

It is difficult to ascertain accurately the slope of the water surface in a stream, since in nearly all streams there are pulsations in the water, causing the surface to rise and fall locally. In most streams the slope of the bottom is far from uniform, and the flow of water in any given section is more or less influenced by the flow in the adjacent section, above or below. For this reason it is a good plan to consider a number of adjacent sections, comprising a considerable length of the stream in one computation, being careful to take into account the diversity of cross-section at various places in the length.

In determining the slope of the surface of a stream, levels are taken of the water surface at each end of the slope section, and referred to some datum or bench mark. A good plan is to set firmly a stout wooden stake below the water surface at each end of the slope section, and then to drive a nail into the top of each stake, so that the nail-head will exactly coincide with the water surface. The difference in elevation between the two nail-heads, divided by the distance between the stakes, will give the slope.

The wetted perimeter is that portion of a stream channel that is in contact with the water. The form or outline of the wetted perimeter of a stream has an important influence upon the velocity of the current. It is usually determined graphically from the plotted cross-section or may be measured by means of a flexible tape or chain after the flood has subsided.

The hydraulic radius, which is sometimes called the mean radius of the channel below the water surface is found by dividing the area of the cross-section (in sq. ft.) by the length of the wetted perimeter (in feet).

The Chezy formula, which is the fundamental formula for stream discharge, is:

in which  $Q = AV$   
 $Q$  = the discharge of the stream in sec. ft.  
 $A$  = the area of the cross-section in sq. feet.  
 $V$  = the mean velocity of flow, in ft. per sec.

In applying this formula to the determination of stream discharge, the mean velocity of a stream is considered a function of the slope and of the wetted perimeter of the stream. This may be expressed by formula as follows:

in which  $V = C \sqrt{rs}$   
 $r$  = the hydraulic radius of the channel.  
 $s$  = the surface slope.  
 and  $C$  is a variable coefficient, depending upon the nature of the channel.

In determining the value of  $C$  for any given case it is customary to make use of Kutter's formula, which is:—

$$C = \frac{41.6 + \frac{.00281}{s} + \frac{1.811}{n}}{1 + \left\{ 41.6 + \frac{.00281}{s} \right\} \sqrt{\frac{n}{r}}}$$

In this formula  $r$  and  $s$  have the same significance as in the Chezy formula and the new factor  $n$  is called the coefficient of roughness. It is a variable coefficient, and its value is dependent upon the size, shape, slope and degree of roughness of the channel. Tables of values of  $n$  are given in various text books, but it is difficult to choose the correct value. It is therefore advisable whenever possible to compute the value of  $n$  from a measured discharge. As the slope method of determining discharge is seldom employed except to estimate flood discharge, a current meter measurement is very often made at the slope section, during low water. Having determined the mean velocity, slope and hydraulic radius at the time of the metering, the value of  $C$  may be found from the formula  $V = C \sqrt{rs}$  or  $C = \frac{V}{\sqrt{rs}}$ . Trautwine's Pocket Book for Civil Engineers and other texts contain tables giving the value of  $n$  for different values of  $r$ ,  $s$ , and  $c$ . From

these tables we can interpolate the proper value of  $n$  for a particular section of the stream, at low water stage. In most cases this value of  $n$  is applicable to high water and flood conditions of the stream also and is used with values of  $r$  and  $s$  for the high water or flood cross-section to determine the value of  $C$  at the higher stage. Having determined the value of  $C$  the computation of the discharge is simple.

The results obtained by the slope method are in general only roughly approximate, owing to the difficulty in obtaining accurate data and the uncertainty of the value of  $n$  to be used.

**WEIR METHOD OF DETERMINING DISCHARGE.**—As yet no permanent weirs have been constructed by this survey, and the only regular weir measurements have been on small streams by means of a temporary weir. The weir used consists of a wooden base of 2-inch plank, to which is bolted a rectangular notch of three-eighths inch steel with bevelled edges. (See photo.)

In making a measurement by means of a temporary weir, the following directions should be followed as far as possible. The weir should be placed perpendicular and at right angles to the bed of the stream with the crest level. The discharge should be free in so much as the nappe should have sufficient fall to allow air to have free circulation underneath it, and the head or depth on the crest should not exceed one-third of the length. The channel of approach should be several times as wide as the opening and the depth of water in the bay or pond should be at least twice the head on the weir, so as to eliminate velocity of approach and cross-currents. In choosing a site for a weir, a point should be chosen that will fulfil the above conditions and give a good sized bay or pond.

To set up a temporary weir, a dam of sods and earth is thrown across the stream, the weir is set in place and the sods are tramped firmly around it to stop all leakage. On a stream with a sandy bed, sods or clay must be placed on the bottom for a few feet upstream to form a mattress to prevent the undermining of the dam.

After the bay has filled up, the head of the water is observed by taking the difference in elevation of the crest of the weir and the elevation of the water surface in the bay at a distance of 4 to 10 feet from the weir, with an engineer's level. Two common methods of getting the elevation of the water surface are (1) hold the levelling rod on a stone or other solid body under water and subtract the depth of water on the rod from the sight on the rod; (2) drive a pin divided into tenths of feet into the bed of the stream so that an even tenth is level with the surface of the water, then hold the levelling rod on the top of the pin and add the length of pin above the water to the sight on the rod.

When the head of water has been determined, the discharge is computed by using one of the standard formulæ which will suit the case. Tables giving the discharges for different heads and lengths of crests are published in many engineering texts.

The formula used by this survey for rectangular sharp-crested weirs is:

$$Q = 3.33 (L - .2H) H^{3/2} \text{ being a modification of Francis' formula, to allow for end contractions and elimination of velocity of approach.}$$

in which  $Q$  = discharge in sec. ft.;  $L$  = length of crest in feet;  $H$  = head in feet.

Measurements by means of temporary weirs should be made some distance above or below the gauge. If they are made close to a gauge, the gauge must be read before the weir is placed in the stream and the pond must be allowed to run off after the weir is removed before the gauge is re-read.

**VELOCITY METHOD OF DETERMINING DISCHARGE.**—There are two methods of determining the velocity of flow of a stream, namely, direct and indirect. In the direct method by which the velocity is determined by means of floats, the liability of error is large, and the results far from satisfactory. This method is seldom used except for very rough estimates or when a current meter cannot be used. There are three common kinds of floats, viz: surface, sub-surface and tube or rod floats. In each the procedure is the same. A straight piece of channel is selected for the run and two cross-sections are taken at some convenient distance apart, usually from 100 to 200 feet. They are then divided into strips by means of a tagged wire. The velocity in each strip is then measured by noting the time taken by the float in traversing the run or distance between the two cross-sections. As the time and distance are both known the velocity can easily be computed. The velocity, whether measured by surface, sub-surface or tube floats, must be multiplied by a coefficient less than unity to reduce the mean velocity before being used to compute the discharge.

The indirect or current meter method is the most reliable and most widely used method of determining the velocity of the flow of a stream. The meter used by this survey is the Price Patent, manufactured by W. & L. E. Gurley, Troy, N.Y. It consists of six cups attached to a vertical shaft which revolves on a conical hardened steel point when immersed in moving water. The number of revolutions is indicated electrically. The rating or relation between the velocity of the moving water and the revolutions of the wheel is determined for each meter by drawing it through still water for a given distance at different speeds and noting the number of revolutions for each run. From this data a rating table is prepared which gives the velocity per second of moving water for any number of revolutions in a given time interval.

In making a measurement with a current meter, a number of points, called measuring points, are measured off above and in the plane of the measuring section, at which observations of depth

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and velocity are taken. These points are spaced equally for those parts of the section where the flow is uniform and smooth, but should be spaced unequally for other parts according to the discretion and judgment of the engineer. In general, the points should not be spaced farther apart than 5 per cent. of the distance between piers, nor farther apart than the approximate mean depth of the section at the time of measurement.

The measuring points divide the total cross-section into elementary strips at each end of which observations of depth and velocity are made. The discharge of any elementary strip is the product of the average of the depths at the ends, the width of the strip, and the average of the mean velocities at the two ends of the strip. The sum of the discharges of the elementary strips is the total discharge of the stream.

The accuracy of a discharge measurement taken at a velocity area station is dependent on two factors, the accuracy with which the area of the cross-section and the mean velocity of the flow normal to that section are measured. The greatest, and the most common errors in measurements of discharge are caused by erroneous soundings. Errors in soundings by weight and line are due to the weight being carried down-stream, or, sometimes, to the bowing of the line. Both these causes make the soundings too great. Errors in soundings with rods are due to the rod not being perpendicular, to the water rising on the rod, and to the rod sinking in the bed. In order to verify the accuracy of soundings made at medium or high stages, they should be compared with those at low water. The mean velocity is also very difficult to measure accurately, because it is constantly changing. It varies not only from the surface to the bottom but from one bank of the stream to the other, making it necessary to measure it at a number of points.

## METHODS OF DETERMINING MEAN VELOCITY.

There are a number of different methods of determining the mean velocity at the ends of these strips, or, as it is commonly called, the mean velocity in a vertical, namely, multiple-point, single-point, and integration. These three principal multiple-point methods in general use are the vertical velocity-curve, three-point and two-point method.

**VERTICAL VELOCITY CURVE METHOD OF DETERMINING MEAN VELOCITY.**—In this method the centre of the meter is held as close to the surface of the water as is possible, being careful to keep it out of reach of all surface disturbances, and then at a number of different depths throughout the vertical. The velocity at each position of the meter is recorded. These observations are then plotted with velocities in feet per second as abscissae and their corresponding depths in feet as ordinates and a mean curve is drawn through the points. The mean velocity for the vertical is obtained by dividing the area bounded by the curve and its axis by the depth. In the absence of a planimeter for measuring the area, the depth is divided into 5 to 10 equal parts, and the velocities of the centre ordinates of these parts are noted. The mean of these velocities will very closely approximate the mean in the vertical.

It is often more convenient, when the depth is a number of feet and a fraction, as 7.4, to divide the depth into 7 parts of a foot width, and a part of 0.4 foot width. Then the velocity to enter for the narrow part is 0.4 of the velocity at the centre of it.

The vertical velocity curve is useful in studying the manner in which velocities occur in a vertical. From a study of a number of these curves the other shorter methods of determining mean velocity are deduced. This method is not used in general routine measurements, except during the winter, on account of the length of time taken to complete a measurement, for a change of stage is almost sure to occur during a measurement on a large stream which counterbalances the increased accuracy. For this reason its use is limited to the determination of the coefficient to be used in the reduction of values obtained by other methods of measuring velocity to the true value, to the measurement of velocities under new and unusual conditions of flow, and for measurements under ice.

**THREE-POINT METHOD OF DETERMINING MEAN VELOCITY.**—This method gives the greatest accuracy outside of the vertical velocity curve and is the method most commonly used by this survey during the open season. The meter is held at 0.2, 0.6 and 0.8 depth. The mean velocity is then obtained by dividing by 4 the sum of the velocities at 0.2 and 0.8 depth plus twice the velocity at 0.6 depth. It is the best method to use during low water or in wide shallow streams having a rough bed where the thread of mean velocity varies considerably from the 0.6 depth.

**TWO-POINT METHOD OF DETERMINING MEAN VELOCITY.**—In studying the vertical curves made at a number of different points and under varied conditions, it has been found that the mean of the velocities occurring at 0.2 and 0.8 depth gives very nearly the mean velocity in the vertical. Use is made of this fact in the two-point method of determining mean velocity, the meter being held at 0.2 and 0.8 depth in the vertical. This method has been found more accurate than the single point method and the time required for a metering is not very much greater. This method has been found to give, also, a very close approximate to the mean velocity in measurements of ice-covered streams, although these flow under very different conditions from those of open water.

**SINGLE-POINT METHOD OF DETERMINING MEAN VELOCITY.**—Experiments made under most favourable conditions and extending over a long period have established the point of mean velocity in a vertical at 0.6 of the depth. Therefore the error resulting from the use of the 0.6 depth as the depth of mean velocity is very small though in some few cases a study of the vertical

velocity curve will show the need of a coefficient to reduce the observed velocities to the mean. The variation of the coefficient from unity in individual cases is, however, greater than the two or three point method and the general results are not as satisfactory. For that reason this method is not employed very extensively by the survey.

In the other principal single-point method the meter is held near the surface, at from 0.5 to 1 foot below the surface, care being taken to sink the instrument below the influence of wind or waves. The resulting velocities must be multiplied by a coefficient to reduce them to mean velocities. This coefficient as found by a large number of experiments, varies from 0.78 to 0.98, depending upon the depth and speed of the stream. The deeper the stream and the greater the velocity, the larger the coefficient. In flood work coefficients varying from 0.90 to 0.95 should be used. This method is only used when the current is too strong to permit the sinking of the meter to any great depth below the surface of the water. It is often employed at times of flood, or when a stream is carrying a lot of drift wood or ice.

**INTEGRATION METHOD OF DETERMINING MEAN VELOCITY.**—This method of determining the mean velocity in a vertical consists in moving the meter at a slow uniform speed from the bed of the stream to the surface and return in a vertical direction, the time and revolutions being observed. In travelling through all parts of the vertical the meter is acted upon by each and every thread of velocity from the bed to the surface of the stream, and the resulting observations determine the mean in that vertical.

This method is very useful in checking the results of other methods. It is, however, seldom used by this survey as the Price meter is not suited to observations by this method, since the vertical motion of the meter causes the wheel to revolve.

#### GAUGING STATIONS.

The first step is to select a suitable locality for a gauging station. Although apparently simple, this is really a difficult task. Not only must the water be moving in nearly straight lines over a solid bed and between well defined banks, but the place must be accessible at moderate cost and there must be living near a competent person who can be engaged to serve as observer. Permanent gauging stations should only be selected after a very thorough reconnaissance. In the irrigation districts and in more thickly populated districts there is more or less diversion of water. This is apt to complicate matters for the hydrographer, or a gauging station above all works may not include all the tributaries of the stream and it is often necessary to establish gauging stations at several points along the streams, and on tributaries, canals and pipe lines, in order to obtain complete information regarding the water supply in a particular stream.

There are three classes of gauging stations, namely, wading, bridge and cable stations. The wading station can of course only be used in the case of small streams having a maximum depth at its highest stage of 3 feet or less. The equipment for a wading station is small, consisting usually of a plain staff gauge, graduated to feet and hundredths, and fixed vertically to one of the banks of the stream. For convenience a measuring line, usually a wire with tags, may be fixed permanently at this section. When taking the reading, the hydrographer should stand below and to one side of the meter so as to not cause eddies in the water.

Bridge stations, because of their permanency and the freedom of movement allowed the hydrographer, are much preferred. Very often, however, more particularly in swift currents, the piers materially affect the accuracy of the results. When the gauge cannot be attached to a pier, it is often attached horizontally to the guard-rail or floor of the bridge, and the height of the stream is found by lowering a weight by a chain over a pulley. It is indicated by a marker on the chain. Distances of three, five or ten feet, according to the size of the stream, are marked on the lower chord of the sown stream side of the bridge, to serve as a measuring line.

Frequently it is impossible to establish a permanent gauging station at a bridge. In that case the wire cable of a ferry can be utilized, or, if that is not available, a permanent wire cable is stretched across the river. For spans of average length a galvanized wire cable three-fourths of an inch in diameter is safe. It is supported at each bank by means of high struts or by passing it through the crotch of a tree. The cable is run into the ground and anchored securely to a "dead man" buried at least six feet below the surface, or, if convenient, it is anchored to the lower part of the trunk of a tree. A turnbuckle is inserted in the cable between the strut and anchorage to permit tightening the cable when it begins to sag. A permanent measuring line, usually a wire, with tags 5 or 10 feet apart, is stretched across the stream just above the cable. A cage large enough to carry two men and instruments is constructed and suspended from the cable by means of cast iron pulleys. The cage is moved from point to point by hand. A stay line, usually quarter-inch guy wire, is stretched across the stream about thirty to forty feet upstream from the cable, and securely fastened. By passing a sash cord through a pulley hung on this stay line the current meter is prevented from being carried down stream.

#### LOW VELOCITY LIMITATIONS.

Owing to the presence of a slight amount of friction in the current meter, a certain definite velocity is required to make the wheel revolve, *i.e.*, to overcome the frictional resistance of the wheel. For this reason the meter is unsuitable for the measurement of low velocities, approaching

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# DEPARTMENT OF THE INTERIOR IRRIGATION OFFICE

DISCHARGE, MEAN VELOCITY AND AREA CURVES  
OF

## ELBOW RIVER AT CALGARY

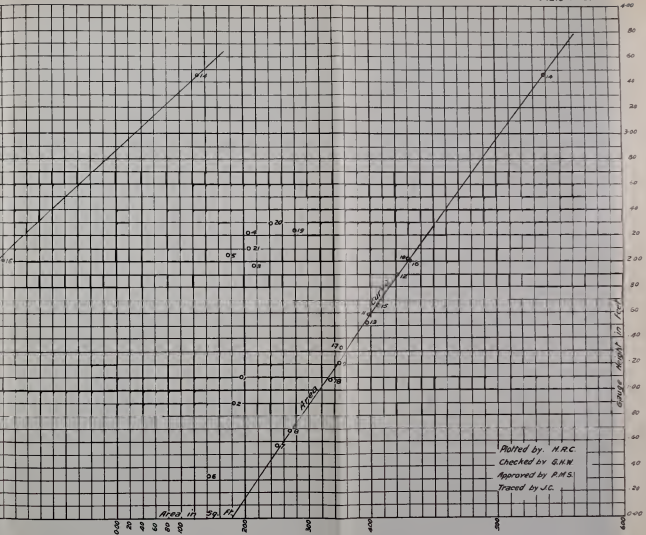
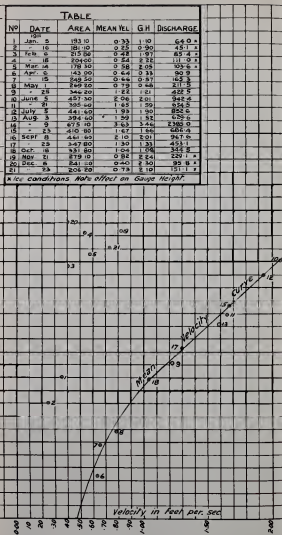
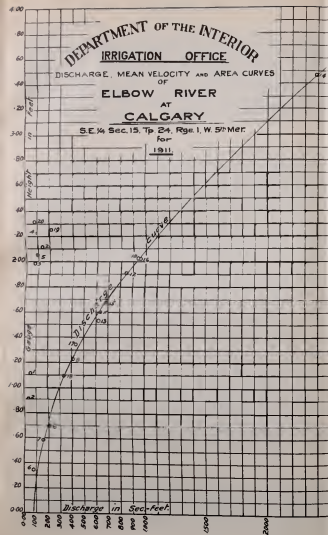
S.E. ¼ Sec. 15, Tp. 24, Rge. 1, W. 5<sup>th</sup> Mer.

for

1911.

NO	DATE	AREA	MEAN VEL	G.H.	DISCHARGE
1	Jan. 5	183.10	0.33	1.10	64.0 *
2	" 16	181.10	0.25	0.90	45.1 *
3	Feb. 4	215.00	0.28	0.97	85.4 *
4	" 16	224.00	0.24	0.82	111.0 *
5	Mar. 26	178.30	0.58	2.08	103.6 *
6	Apr. 6	143.00	0.64	0.38	90.9
7	" 15	249.50	0.66	0.87	165.3
8	May 1	269.20	0.79	0.66	211.5
9	" 25	346.20	1.22	1.21	422.5
10	June 5	457.40	2.06	2.01	942.2
11	" 21	305.60	1.65	1.99	504.2
12	July 5	441.60	1.93	1.90	852.6
13	Aug. 3	394.60	1.59	1.52	625.6
14	" 9	675.10	2.63	3.46	2380.0
15	" 25	410.00	1.67	1.66	686.4
16	SEPT. 8	461.60	2.10	2.01	967.0
17	" 25	367.00	1.50	1.33	453.1
18	Oct. 18	137.60	1.04	1.06	345.5
19	Nov. 21	679.10	0.82	2.24	220.1 *
20	Dec. 8	241.00	0.40	2.30	95.8 *
21	" 23	208.00	0.75	2.10	151.1 *

\* Ice conditions had no effect on Gauge Height.



Plotted by H.R.C.  
Checked by G.H.W.  
Approved by R.M.S.  
Traced by J.C.



## SESSIONAL PAPER No. 25d

this value. This velocity, which is required to overcome friction, and which is obtained from the meter rating curve, is called the velocity of no flow for the particular meter referred to. It varies in different types of meters, and also slightly in meters of the same type, according to the time the meter is in use, but very seldom exceeds 0.2 foot per second in any meter. From a number of observations the low velocity limit, below which values of velocity are unreliable, is found to be 0.5 foot per second. In many cases at low stages the gauging station on a stream becomes unsuitable for a discharge measurement owing to the mean velocity in the section falling below the safe limit. In such instances where it is possible to wade the stream a suitable gauging section may be located within a reasonable distance of the regular station and the discharge measurements made at this point. When a gauging is made at a cross-section other than the regular station, sufficient soundings should be made at the latter at the time of the gauging to develop the cross-section and compute the area. The measurement is thus referred to the regular gauging station and the mean velocity and area at the regular section is reported and used in the office computations.

## WINTER MEASUREMENTS.

The laws governing the flow of streams in open channels have, through extensive investigations, become well defined, but the flow under an ice cover has been but little investigated. In winter, as in summer, the daily discharge of a stream is computed from frequent discharge measurements and daily gauge height observations. In most cases, however, the vertical velocity curve method is used for the determination of the mean velocity in the vertical, as the mean velocity varies considerably. In fact, there are usually two points in the vertical at which the thread of mean velocity occurs under an ice cover. These points are near 0.2 and 0.8 depths and the two-point method will give fairly accurate results, but in this report all discharges are based on computations from vertical velocity curves.

The discharge measurements are made through holes in the ice from five to ten feet apart, and large enough to allow the meter to pass through freely. The measurement is then taken in the same manner as at open sections, except that the depth of the stream is taken as the distance from the bottom of the ice to the bed of the stream. The soundings, however, are always referred to the surface of the water in the holes, the distance from the surface of the water to the bottom of the ice being measured and subtracted from the sounding to obtain the depth. The meter should be kept in the water continuously to prevent the wheel from freezing and sticking.

The gauge is read once a day, the observer noting the elevation of the water as it rises in a hole cut through the ice, the height of the top of the ice, the thickness of the ice, presence of needle or slush ice, snow on top of ice, ice jams, and any sudden changes in temperature. To do this the observers are provided with an ice chisel for chopping holes, and a square to measure the thickness of the ice. Any form of gauge may be used, but the chain gauge is the most satisfactory, as the staff gauge, being frozen to the ice, heaves with it.

Some of the cross-sections used in the summer were found to be unsuitable for winter measurements. This was usually caused by the cross-section filling up with slush, needle or anchor ice. There is a flow through this ice and it is impossible to measure it. The most suitable stations for winter measurements are those where there is a long stretch of very smooth, sluggish water above the station and a rapid fall below.

There are certain conditions in Western Canada which make it exceptionally difficult to make estimates of the daily discharge during the winter. The gauge height in many cases fluctuates very much, and often sudden rises or drops occur. These rises are often explained by the fact that during very cold spells a great deal of slush, frazil, and anchor ice is formed and chokes up the channel, thus raising the surface of the water, when in reality the discharge is decreasing. Then again, a chinook causes a sudden rise in temperature and the discharge is often increased, while at the same time the gauge height gradually lowers, evidently because the warmer water and weather have melted out a lot of the ice from the channel and given it a greater carrying capacity. So far, investigations have proved that in order to make reliable estimates of the daily discharge, gaugings must be made at short intervals and the weather conditions and temperature must be very carefully noted. There is, under the present methods, a great deal of work in calculating the discharge by the vertical velocity curve method and in estimating the daily discharge during the winter months, but as yet no improved or shorter methods have been discovered. It is hoped, however, that in the near future, the laws governing the flow under ice will be better understood and shorter and easier methods evolved.

## RE-RATING OF CURRENT METERS.

Each meter is rated before being used, in order to determine the relation between the revolutions of the wheel and the velocity of the water. The meter is driven at a uniform rate of speed through still water for a given distance, and the number of revolutions of the wheel and the time are recorded. From this data the number of revolutions per second and the corresponding velocity per second are computed. Tests are made for speeds varying from the slowest which will cause the wheel to revolve to several feet per second. The results of these runs, when plotted with revolutions per second as abscissae, and velocity in feet per second as ordinates, locate points that



define the meter-rating-curve, which for all meters is practically a straight line. From this curve a meter rating table is prepared. Theoretically, the rating for all meters of the same make and type should be the same, but as a result of slight variations in construction and in the bearing of the wheel on the axis at different velocities the ratings differ. After a meter has been in use for some time the cups may have received small injuries, or the bearing of the wheel on the axis may have changed owing to unavoidable rough usage. These changes will affect the running of the meter and change its rating. As a consequence each meter is re-rated at regular intervals and a new rating curve and table prepared.

Particulars of the rating station, a discussion of the methods employed, and the results of ratings, are given in an interesting article on Current Meter Rating, written by H. O. Brown, B.A. Sc., which is attached to this report as an appendix.

#### OFFICE COMPUTATIONS.

**RATING CURVES AND TABLES.**—When a series of discharge measurements has been made at a gauging station a rating curve is constructed for that station, showing graphically the discharge corresponding to any stage of the stream within the limits covered by the gaugings. This curve, as it is usually drawn, has as abscissae, the discharges in second-feet and as ordinates, the corresponding gauge heights at which the discharges were made. A smooth curve is drawn through the resulting set of points and from this curve the discharges at any stage within the limits of the curve are taken. Some measurements may be more reliable than others, owing to more or less favourable conditions at different times of gauging, or to other causes. In order to obtain the weight of the different measurements, curves with area and mean velocity, as abscissae, and gauge heights as ordinates, are also drawn. From a study of these curves any discrepancies in a measurement, either in its area or mean velocity, may be detected. Should it be necessary to extend the rating curve beyond the limits of actual discharge measurements the area and mean velocity curves may be constructed to the stages for which the discharge curve is desired and the latter found by taking the product of the two curves. The discharge curve under natural conditions of flow is always convex to the gauge height axis. The area curve is either a straight line or is convex to the gauge height axis, except in the case of overhanging banks when it becomes concave to the axis. The mean velocity curve is always concave to the gauge height axis, except in cases where standing water occurs below the stage of no-flow. In this case the curve will assume a reverse form, starting from the gauge height of zero flow with a curve convex to the gauge height axis and gradually reversing to a curve concave to this axis. In plotting all three curves the horizontal and vertical scales should be so chosen that the curves may be used within the limits of accuracy for the work, and in their critical position will make, as nearly as possible, angles of 45 degrees with each axis.

The rating curve being constructed it becomes necessary to prepare a station rating table, giving the discharge at any stage of the stream within the limits of the daily gauge height observations on record. From this rating table the daily discharges corresponding to the daily gauge heights are read and tabulated. The rating table is constructed for tenths, half-tenths, or hundredths of feet, according to the readings of the gauge to which it is to be applied. The discharges for this table are read directly from the rating curve and are then adjusted so that the differences for successive stages shall be either constant or gradually increasing, but never decreasing, unless the station is affected by backwater.

**DAILY DISCHARGE, MONTHLY MEAN, AND RUN-OFF.**—The rating table being made to cover the range of daily gauge height observations, the next procedure in the computations is to make out a table of daily discharges from this rating table. The daily gauge heights are copied as they were sent in by the observer and opposite each the corresponding discharge is filled in from the rating table. The monthly discharge is found by totalling the daily discharges for the month in question, and the monthly mean is obtained by dividing this total by the number of days in the month.

The run-off is computed with two different sets of units, depending upon the kind of work for which the data is intended, as follows: (1) Run-off in inches is the depth to which a plane surface equal in extent to the drainage area would be covered if all the water flowing from it in a given time were conserved and uniformly distributed thereon; it is used for comparing run-off with rain-fall, which is usually expressed in depth in inches. The mean run-off in second-feet per square mile for each month is used. The monthly mean run-off in second-feet is divided by the area of the drainage basin in square miles to find the monthly mean run-off per square mile. This result, reduced to run-off in depth in inches for the monthly period, is in the form required.

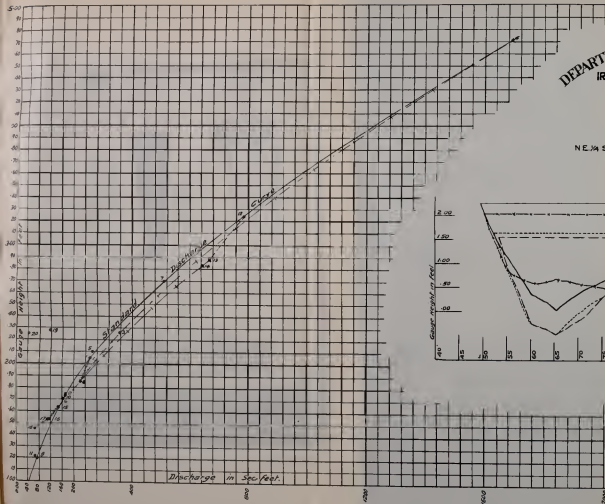
(2) The run-off in acre-feet is the form of most use in connection with storage. An acre-foot is equivalent to 43,560 cubic feet, and is the quantity of water required to cover an acre to the depth of one foot. The monthly mean run-off in second-feet is used for the computation of run-off in acre-feet. The monthly mean is reduced to cubic feet per month and this quantity divided by 43,560 gives the run-off in acre-feet.

The run-off of the stream being computed both in depth in inches and in acre-feet for each month, the run-off for the period, during which observations of run-off were made, is found by the summation of the amounts of run-off for the several months making up this period.





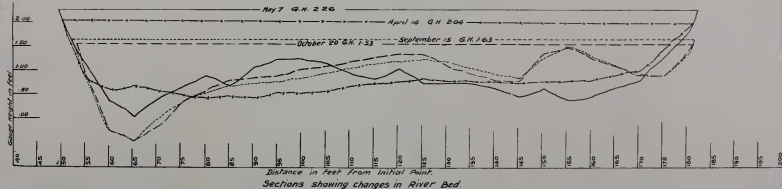




DEPARTMENT OF THE INTERIOR  
 IRRIGATION OFFICE  
 DISCHARGE CURVE  
 OF  
 MILK RIVER  
 AT  
 MILK RIVER  
 NE 1/4 Sec 21, Tp. 2, Rge 16, W 40 Mer.  
 for  
 1911.

No.	DATE	AREA	MEAN VEL.	G.H.	DISCHARGE
1	APR 16	150.51	1.61	2.04	258.60
2	MAY 2	151.08	1.59	1.65	273.81
3	" 7	156.39	1.92	2.28	358.92
4	" 17	184.14	2.30	4.75	1092.23
5	" 22	157.40	1.60	2.10	263.85
6	JUNE 13	113.83	1.48	1.19	162.00
7	" 28	245.10	2.09	2.70	672.00
8	JULY 5	120.80	1.45	1.25	175.25
9	" 29	53.82	1.05	1.20	75.12
10	AUG 10	129.28	1.34	1.75	172.40
11	" 30	57.47	.99	1.28	86.70
12	SEPT 7	226.50	2.66	3.24	783.48
13	" 6	263.11	2.48	2.68	667.35
14	" 9	252.15	2.48	2.83	623.35
15	" 15	122.04	1.45	1.83	147.70
16	OCT 14	63.75	1.36	1.53	113.50
17	" 20	65.88	1.32	1.53	112.45
18	NOV 10	45.18	1.22	1.45	75.50
19	DEC 7	101.67	1.18	2.38	115.80
20	" 23	53.35	0.90	2.25	47.37

*like conditions Note effect on Gauge Height.*



*Note - Bolster Method used in estimating the daily discharge during periods of changing conditions.*

Plotted by J.E.D.  
 Checked by L.I.G.  
 Approved by H.R.C.  
 Traced by J.C.



Meters and Equipment for Measuring the Discharge of a Stream by the Velocity Method.  
Taken by F. H. Peters





Gauging a small creek with a fifteen inch weir. Taken by R. J. Burley.





## SESSIONAL PAPER No. 25d

CHANGING CONDITIONS OF CHANNEL.—On streams such as Milk River, whose bed is in a constant state of motion, measurements of discharge should be made every few days, otherwise considerable data relating to changes cannot be obtained. For discharges on days other than those on which measurements are taken, the interpolation method is used. The two methods of interpolation in general use are the Stout and Bolster Methods.

The Stout method deals with the correction of the gauge heights. A curve is drawn, using the difference between the actual gauge heights at the time of measurement and the gauge height corresponding to the measured discharge as ordinates and the corresponding days of the month as abscissae. From an irregular curve drawn through these points corrections for gauge heights can be made for days on which there was no discharge measurement. When the discharge is greater than that given by the curve the correction is positive and vice-versa. Each daily gauge height is corrected by the amount shown on the correction curve, and the corresponding discharge taken from an approximate rating curve for the station.

The Bolster method deals more particularly with the modification of the discharge. Results of discharge measurements covering a whole year or season are plotted, and though considerably scattered, will define one or more regular curves, called standard curves, the number and position of each indicating the radical changes. Where the river bed changes from day to day, the position of the standard curve also varies and must pass through the points indicating the different days. The points indicating two successive measurements are joined by a line, which for short distances on the cross-section paper is a straight line and otherwise a curve. This line is divided into a number of equal parts, each indicating an intervening day, the assumption being that as the change during this period is gradual the daily rating must pass through each point or day, as represented by the divisions. A simple and convenient way of making these interpolations and moving the daily rating curve is to make a tracing of the standard curve with a vertical line of reference. By keeping the lines of reference coincident this curve can be shifted into any desired position and the discharge read for any gauge height.

## PEACE RIVER DRAINAGE BASIN.

*General Description.*

Peace River and its tributaries head on the eastern slope of Rocky Mountains in British Columbia and Alberta. The Peace itself heads in British Columbia and is formed by the junction of the Findlay and Parsnip Rivers. It flows eastward and is joined by a number of smaller streams in British Columbia and Alberta. The chief of the latter is the Smoky River which rises at Mt. Robson and flows northward until it joins the Peace. From the junction of the Smoky with the Peace the main stream flows northward, then easterly, until it empties into the Slave River, which empties into Great Slave Lake, the head of the Mackenzie River.

Little data is available as to the hydrographic features of the country which the Peace drains. Only one measurement was made in this basin during 1912, on A-la-Pache River, a branch of the Smoky River.

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Peace River Drainage Basin, in 1912.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Sec.-ft.</i>
Oct. 23....	G. H. Whyte....	A-la-Pache River	Tp. 57, Rge. 5, W. 6th M.....	42	39 5	2.52	99.7

NOTE.—*Width* in the actual width of water surface, not including piers. *Area of section* is the total area of the measured section, including both moving and still water.

## ATHABASCA RIVER DRAINAGE BASIN.

*General Description.*

Athabasca River rises on the eastern slope of Rocky Mountains and flows in a north-easterly direction for about one thousand miles, eventually emptying into Lake Athabasca.

The Athabasca basin forms the most southerly portion of the great Mackenzie system and the portion dealt with in this report comprises only the headwaters.

Rising in country very similar to the watershed of the other streams of importance in Alberta, it flows out of the mountains and then through foothill country. From the foothills to the lake the basin consists of stretches of muskeg and uplands, well timbered with spruce and pine.

The general character of the basin is such that the winter precipitation or snow cover is conserved to a great extent and floods in the early spring are not usual. However in June, July and August rains and warm winds cause the upper parts of the system to discharge large quantities of the snow water from the higher peaks and glaciers and when rains of any magnitude occur the invariable result is a flood. The muskeg country is a great source of storage, but when its capacity is reached, it accelerates rather than retards the run-off.

The main transcontinental lines of the Grand Trunk Pacific and the Canadian Northern railways cross the upper portion of this drainage basin, and transportation is now a much easier problem than in the past.

Many valuable deposits of coal, limestone and other minerals are found in this basin, and on account of these, as well as the many power possibilities and stretches of timber and pulpwood, it is expected that this country will develop very much during the next few years.

During 1912 only miscellaneous measurements were obtained in this basin, but regular stations will be established in the near future at the most important points on Athabasca River and its tributaries.

## SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Athabasca River Drainage Basin, in 1912.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
Sept. 18...	G. H. Whyte...	Athabasca River...	S.W. 8-51-25-5...	250	1739	4.22	7334
Sept. 16...	do	Beaverdam River...	48-22-5 (at mouth)	42	82.6	1.30	107
Oct. 25...	do	Baptiste River...	56-3-6				200
Oct. 25...	do	W. B. do	do				40
Oct. 26...	do	S. B. do	54-2-6	26	14.3	1.45	21
Sept. 13...	do	Dummy Creek...	Sec. 33-48-21-5...	14	15.5	0.76	12
Sept. 14...	do	Embarras River...	do	24	26.0	1.54	40
Oct. 28...	do	Hay River...	53-27-5				500
Sept. 16...	do	McLeod River...	48-22-5 (above Beaverdam)	109	135.0	2.69	364
Sept. 16...	do	do	48-22-5 (below Beaverdam)				471
Oct. 15...	do	W. B. River...	49-23-5	57	66.2	2.02	133
Sept. 20...	do	Miette River...	47-1-6	54	87.6	2.34	205
Oct. 27...	do	Pintohorse Creek...	54-27-5				20
Sept. 18...	do	Prairie Creek...	N.W. 5-51-25-5...	30	40.1	2.14	86

① Estimated flow with floats.

NOTE.—Width is the actual width of water surface, not including piers. Area of section is the total area of the measured section, including both moving and still water.

## NORTH SASKATCHEWAN RIVER DRAINAGE BASIN.

*General Description.*

The North Saskatchewan River draws its water supply from the eastern slope of the Rocky Mountains. The basin is bounded on the south by that of the Red Deer River and on the north by that of the Athabasca River. Its principal tributaries in the mountain district are the Clearwater and Brazeau Rivers. In addition to these there are a great number of smaller streams draining into the river. From the city of Edmonton the river takes a north and easterly course for about forty or fifty miles and then flows in an easterly direction to its junction with the South Saskatchewan River a few miles east of the city of Prince Albert, Saskatchewan. From this point it is known as the Saskatchewan River. The greater part of the drainage basin in the prairie section lies to the south of the river and the principal tributaries are the Vermillion and Battle Rivers, the former emptying into the main stream north and a little west of the town of Lloydminster and the latter in the town of Battleford.

In the mountain section the North Saskatchewan River and its tributaries have well defined rocky valleys with a large amount of fall and the whole drainage basin is well wooded. The valley of the stream widens out as it reaches the prairies into large fertile flats. The timber in this part of the drainage basin is confined mostly to the river valley. The stream bed changes from a rocky and fairly solid formation in the mountain district to a gravel, sandy and very unstable bed as the river comes out on to the prairies.

The stream receives the greater part of its water supply from the mountains. In consequence, the high water occurs in the hot months of summer, caused by the melting snow from the mountains. The low-water period occurs in the winter months when there is a minimum amount of drainage from the snow fields.

Three stations were established on the main stream in 1911, and daily records of gauge height were taken at these stations during the season, as well as discharge measurements at regular intervals. These three stations were located at Edmonton, Battleford and Prince Albert. The only tributary touched upon as yet is Battle River, a gauging station having been established on it at Battleford in 1911.

During 1912 the City of Prince Albert started the construction of a large power plant on the North Saskatchewan River at La Colle Falls, some 26 miles below the city. Little other development of the water powers in this basin has taken place as yet.

To obtain a clear idea of conditions in this drainage basin it is necessary to give a description of the principal characteristics of the different parts of the area. The basin naturally divides itself into five parts.

The first or upper part consists of the eastern slope of the Rocky Mountains. While this part of the basin is not the largest in area, the greater part of the run-off is derived from it. In glaciers and perpetual snows of the higher peaks innumerable small streams rise and flow eastward, forming large streams which empty into the main river. These streams are also fed by the melting of heavy snows and by rains which fall in the mountains at all seasons of the year. The region, being mountainous, has a tendency under these conditions to discharge a great

quantity of water into the streams in a short time. This is seen each Spring as the mountains, being for the most part bare of vegetation, are exposed to the sun which melts the winter's snow in a short time. If this warm weather is accompanied by rain floods take place. The lower parts of the mountains and the valleys have a good forest cover and they alone dampen the effects of warm weather. The streams in this part have a slope of probably 20 to 100 feet per mile.

Below the mountain division are the foothills or second part of the basin. This is the largest in area of the five parts. Here the river heads northeasterly and is joined by a great many rivers of various sizes. The valley of the river becomes better defined and deeper. The country is hilly and rough but is not as broken as the first part. The whole region has a fairly heavy precipitation and is well covered with forest. Large tracts of muskeg are found in this region and while to a certain extent they have a tendency to make the run-off uniform if they become well saturated, they offer less resistance than bare hillside to rapid run-off of heavy rains. The slope of the river in this section is probably from 5 to 20 feet per mile.

From near Edmonton to the mouth of the Vermillion River, the North Saskatchewan River flows through a park-like country with large stretches of prairie. Few tributaries flow into the river and the drainage area of this, the third division is small. The valley is well defined, with few flats along the river. The slope of this section averages  $1\frac{1}{2}$  feet per mile.

The fourth section, from the Vermillion River to Prince Albert, is principally prairie with a few stretches of small timber and second growth. The valley of the river is much wider and the river itself widens out into shallow reaches full of shifting sand bars. Low-lying flats border the river for the greater part of the course. The slope of this section is half a foot per mile.

The fifth and last division is from Prince Albert to below the Grand Forks, or junction with the South Saskatchewan. This section has a slope of  $1\frac{1}{2}$  feet per mile, made up of a series of rapids. The valley is not as deep as in the two previous sections, and the river channel is better defined. The basin is covered with a fair tree growth with very little prairie land.

Below the fifth section, but on the main Saskatchewan River, is a section which consists of a chain of lakes and lagoons surrounded by low-lying lands and muskegs, covered with trees.

#### FLOOD DISCHARGE OF NORTH SASKATCHEWAN RIVER.

From the conditions prevailing on the headwaters in the two upper sections it is seen that the North Saskatchewan River is liable to floods of a greater or less magnitude.

The worst flood in the past fifty years, and in fact as far as records or memory goes, took place in August, 1899.

At that time the river reached a height equal to 35.45 feet on the gauge at Edmonton, or an elevation of 2026.538', Public Works of Canada datum. This height gave a discharge of approximately 180,000 sec.-ft. from an estimate by Kutter's formula. At Prince Albert the gauge height reached was equal to 25.9' on the gauge or an elevation of 1481.997', Public Works of Canada datum. This height gives a discharge of 160,000 sec.-ft. by Kutter's formula.

Legends at Prince Albert and Edmonton give records of higher floods, but both seem to have been caused by ice jams in the spring. The jam at Prince Albert is alleged to have taken place some 35 or 40 years ago, while that at Edmonton took place over 80 years ago.

In 1900 the river reached a gauge height equal to 32 feet on the gauge at Edmonton and did considerable damage. Since August, 1907, we have fairly continuous records and the highest gauge height reached was 26 feet on July 10, 1912, the discharge on this date being about 75,000 sec.-ft.

During the floods of 1899 and 1900 considerable damage was done all along the river, but no actual figures are available. In 1899 the low-level bridge at Edmonton was in process of construction at the time of the flood and it was found necessary to raise the piers eight feet higher than at first proposed so as to provide for floods of such magnitude. The water reached to within one and a half feet of the tops of the present piers at that time.

The cause of the flood of 1899 is rather hard to decide, but in my opinion it can be accounted for by the excessive rains rather than by the melting of snows. The meteorological records at Edmonton for August, 1899, gave 6.43 inches of rainfall or 4.63 inches above the monthly mean. The mean temperature was  $55.7^{\circ}$  or  $3.2^{\circ}$  below the monthly mean. It is very probable that these conditions prevailed to a greater degree in the two upper sections. It is usual to find that the snow has practically all melted by August and as rises had taken place in June and July of 1899 it is probable that this condition prevailed in that year. Therefore I think that the assumption that this flood was caused by rains is borne out. During the whole summer the entire basin had a very heavy rainfall and in the two upper sections this rainfall would be stored to a certain point when it would run off very rapidly and add much of the stored water to the exceptionally heavy rains of August.

A study of our records show that the time it takes for the apex of a flood to reach Prince Albert from Edmonton depends on the discharge, and a flood the size of the one of 1899 would probably take less than three days.

During the highest water of 1912 there was a difference of only 3,000 sec.-ft. in the maximum discharge at Edmonton and Prince Albert, that is the maximum discharge at Prince Albert was 4%.



Valley of Athabaska River near Hinton. Taken by G. H. Whyte.

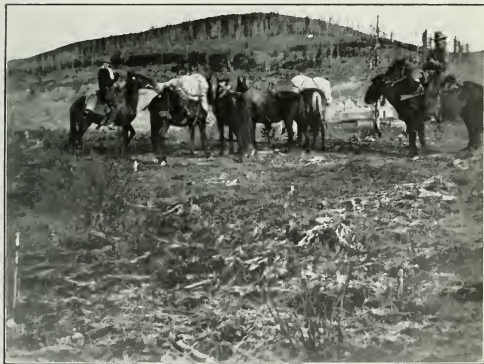


Valley of Hay River, a Tributary of Athabaska River. Taken by G. H. Whyte.





Valley at end of Fishing Lakes in Athabaska River Drainage Basin.  
Taken by G. H. Whyte.

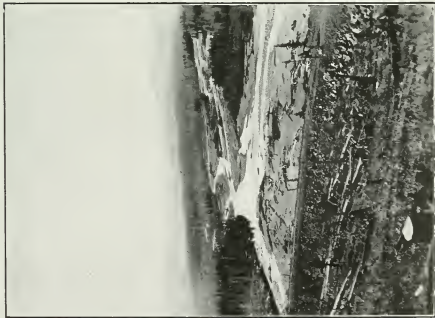


Forest Ranger's pack train about to leave Mile 37, on Alberta Coal Branch of  
Grand Trunk Pacific Railway. Taken by G. H. Whyte.



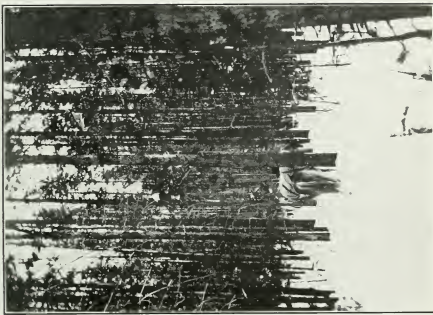


PLATE No. 12



Junction of Beaverdam and Macleod Rivers.  
Taken by G. H. Whyte.

PLATE No. 13



Forest Ranger's blazed trail through the pines.  
Taken by G. H. Whyte.





Railway and Highway Bridge at Prince Albert used as a Gauging Station.  
Taken by G. H. Whyte.

PLATE No. 15



Site of City of Prince Albert Power Dam at La Colle Falls on North Saskatchewan River.  
Taken by G. H. Whyte.



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less than the maximum discharge at Edmonton. For a discharge of 150,000 sec.-ft. the difference would probably be greater.

## NORTH SASKATCHEWAN RIVER AT PRINCE ALBERT.

This station was established October 2, 1911, by J. C. Keith. It is located at the Canadian Northern Railway and traffic bridge in the city of Prince Albert on river lot No. 76, Prince Albert Settlement.

The gauge is of the standard chain type, reading to feet and hundredths. The zero of the gauge (elev. 1456.097) is referred to a permanent Public Works Department of Canada bench mark (assumed elev. 1489.202 above mean sea level), located on the top of the right abutment on its downstream side and marked "P.W.D.B.M. 47." The gauge is situated in the second span from the right bank on the downstream side of the railway bridge, and the length of chain from the bottom of the weight to the marker is 39.32 feet. This gauge replaces the rod gauge used previously and located on the shore face of the first pier from the right bank.

The channel is straight for about one mile above and 300 feet below the station. Both banks are high and will not overflow in ordinary floods. The bed is composed of coarse gravel and boulders with a silting of sand near the piers.

Discharge measurements are made from the downstream side of the bridge, which is a seven-span steel swing structure on cement piers and abutments. The initial point for soundings is 25 feet north of the iron post at the end of the hand rail of the bridge on the downstream side, and is suitably marked on the guard rail of the bridge.

The gauge during 1912 was read by Jas. Crookall, W.A.A. McMaster and W. Moodie.

Due to the fact that ice conditions prevailed during most of the period in which gauge heights were obtained in 1911 it has been decided not to publish the daily discharges obtained, as they are not backed by sufficiently reliable data.

Data *re* floods at this station will be found in another part of this report.

## DISCHARGE MEASUREMENTS of North Saskatchewan River at Prince Albert, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
Oct. 2 and 3 .....	J. C. Keith .....	794.0	4,874	2.14	6.29	10,449
Nov. 24 and 25 .....	do .....	800.0	2,463	1.11	4.26	2,757
Dec. 14 and 15 .....	do .....	....	2,345	1.13	4.59	2,671
1912.						
Jan. 12-15 .....	J. C. Keith .....	600	1,704	0.855	3.94	1,465
Feb. 8, 9 .....	do .....	666	1,381	1.04	4.255	1,430
Feb. 24, 25 .....	do .....	648	1,399	1.14	4.37	1,600
Apr. 29, 30 .....	H. J. Duffield .....	834	5,213	1.93	6.30	10,046
June 1 .....	G. H. Whyte .....	828	5,413	2.64	7.035	14,293
June 19 .....	do .....	770	3,989	2.14	5.82	8,541
July 9 .....	do .....	842	6,236	3.19	8.495	19,893
July 12 .....	do .....	835	5,846	3.07	8.00	17,937
July 13 .....	do .....	878	9,616	5.43	12.62	51,317
July 15 .....	do .....	894	12,406	5.67	15.46	70,466
July 16 .....	do .....	885	11,145	5.33	14.035	59,453
July 17 .....	do .....	877	10,094	4.82	12.90	48,799
July 19 .....	do .....	865	9,189	4.49	12.10	41,230
Aug. 14 .....	do .....	857	7,664	3.75	10.06	28,740
Aug. 24 .....	do .....	879	10,696	4.77	12.99	50,997
Sept. 30 .....	do .....	825	5,030	2.26	6.83	11,350
Nov. 5 .....	do .....	....	....	....	5.50	7,410①

① Impossible to use a metre on account of running ice. Discharge is an estimate from summer curve.

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River at Prince Albert, for 1912.

DAY.	January		February.		March		April		May		June	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.28	1,576	4.15	1,550	4.45	1,610	4.32	1,584	5.65	7,935	6.98	12,756
2.....	4.20	1,560	4.15	1,550	4.45	1,610	4.34	1,588	5.35	6,905	6.85	12,220
3.....	4.15	1,550	4.15	1,550	4.45	1,610	4.35	1,590	5.22	6,484	6.70	11,640
4.....	4.07	1,528	4.18	1,550	4.45	1,610	4.38	1,596	5.20	6,420	6.70	11,640
5.....	4.00	1,500	4.25	1,570	4.45	1,610	4.45	1,610	5.20	6,420	7.12	13,372
6.....	4.00	1,500	4.25	1,570	4.43	1,606	4.60	1,640	5.15	6,265	7.60	15,580
7.....	4.00	1,500	4.25	1,570	4.43	1,606	4.70	2,100	5.10	6,110	7.42	14,752
8.....	4.00	1,500	4.24	1,568	4.43	1,606	4.85	2,950	5.13	6,203	7.10	13,280
9.....	4.00	1,500	4.27	1,574	4.37	1,594	4.95	3,400	5.23	6,516	6.78	11,944
10.....	4.00	1,500	4.30	1,580	4.35	1,594	5.20	4,800	5.68	8,040	6.45	10,735
11.....	3.98	1,492	4.33	1,586	4.30	1,580	5.60	6,950	6.58	11,198	6.30	10,210
12.....	3.95	1,480	4.35	1,590	4.30	1,580	6.00	9,160	6.82	12,100	6.12	9,580
13.....	3.95	1,480	4.35	1,590	4.30	1,580	6.80	12,020	6.87	12,300	5.90	8,810
14.....	3.95	1,480	4.37	1,594	4.30	1,580	7.50	15,120	7.15	13,510	5.68	8,040
15.....	3.95	1,480	4.37	1,594	4.30	1,580	7.78	16,444	7.30	14,200	5.48	7,342
16.....	3.93	1,472	4.37	1,594	4.30	1,580	8.25	18,750	7.30	14,200	5.38	7,004
17.....	3.90	1,460	4.37	1,594	4.28	1,576	7.05	13,060	7.48	15,028	5.35	6,905
18.....	3.90	1,460	4.37	1,594	4.25	1,570	6.55	11,090	7.68	15,964	5.30	6,704
19.....	3.90	1,460	4.37	1,594	4.22	1,564	6.15	9,685	7.50	15,120	5.70	8,110
20.....	3.95	1,480	4.35	1,590	4.20	1,560	6.00	9,160	7.12	13,372	6.32	10,280
21.....	3.98	1,492	4.35	1,590	4.15	1,550	5.95	8,985	6.80	12,020	6.42	10,630
22.....	4.00	1,500	4.40	1,600	4.15	1,550	5.85	8,635	6.48	10,840	6.48	10,840
23.....	4.00	1,500	4.37	1,594	4.12	1,544	5.75	8,285	6.42	10,630	6.65	20,750
24.....	4.00	1,500	4.37	1,594	4.12	1,544	6.00	9,160	6.78	11,944	10.65	32,450
25.....	4.00	1,500	4.37	1,594	4.12	1,544	6.75	11,830	7.30	14,200	10.40	30,700
26.....	4.00	1,500	4.40	1,600	4.15	1,550	6.75	11,830	7.58	15,488	10.00	28,100
27.....	4.07	1,528	4.45	1,610	4.17	1,554	6.78	11,944	7.48	15,028	9.75	26,625
28.....	4.10	1,540	4.42	1,604	4.20	1,560	6.35	10,385	7.15	13,510	9.48	25,140
29.....	4.10	1,540	4.43	1,606	4.25	1,570	6.30	10,210	7.28	14,108	9.32	24,260
30.....	4.10	1,540	....	....	4.30	1,580	6.05	9,335	7.35	14,430	9.65	25,525
31.....	4.12	1,544	....	....	4.30	1,580	....	....	7.12	13,372	....	....

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DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River at Prince Albert, for 1912.—*Concluded.*

DAY.	July		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	9.70	26,350	12.12	43,160	12.27	44,360	6.82	12,100	5.85	8,635	6.36	2,390
2.....	9.72	26,460	11.55	38,760	11.47	38,190	6.84	12,180	5.77	8,355	6.23	2,370
3.....	9.57	25,635	11.01	34,970	10.99	34,830	6.63	11,381	5.99	7,725	6.29	2,320
4.....	9.65	26,075	10.48	31,260	10.78	33,360	6.55	11,090	5.47	7,308	6.10	2,460
5.....	9.72	26,460	10.00	28,100	10.75	33,150	6.57	11,162	5.49	7,376	6.00	2,480
6.....	9.77	26,735	9.67	26,185	10.50	31,400	6.58	11,198	5.38	7,004	5.87	2,510
7.....	9.30	24,150	9.56	25,580	10.21	29,370	6.50	10,910	5.42	7,138	5.85	2,520
8.....	8.80	21,500	9.55	25,525	9.87	27,320	6.40	10,560	5.11	6,141	5.63	2,580
9.....	8.48	19,900	9.46	25,030	9.41	24,755	6.33	10,315	5.23	6,516	5.60	2,600
10.....	8.22	18,600	9.45	24,975	9.13	23,215	6.30	10,210	5.07	6,020	5.60	2,600
11.....	8.09	17,950	9.47	25,085	8.93	22,150	6.23	9,905	4.89	4,944	5.62	2,580
12.....	8.06	17,800	9.65	26,075	8.93	22,150	6.15	9,685	4.69	4,944	6.00	②2,500
13.....	11.28	36,860	10.22	29,440	8.89	21,950	6.02	9,230	4.55	4,580	6.32	2,100
14.....	15.46	69,880	10.09	28,640	8.75	21,250	6.07	9,405	4.45	4,325	6.07	2,370
15.....	15.23	68,040	9.62	25,910	8.47	19,850	6.07	9,405	4.27	3,920	5.98	2,485
16.....	13.95	57,800	9.23	23,765	8.33	19,150	5.97	9,055	3.87	3,153	5.86	2,395
17.....	12.91	49,480	9.23	23,765	8.35	19,250	6.02	9,230	3.41	2,328	5.85	2,388
18.....	12.31	44,680	9.33	24,315	8.35	19,250	6.07	9,405	3.70	2,840	5.67	2,252
19.....	12.15	43,400	9.23	23,765	8.17	18,350	6.31	10,245	3.41	2,328	5.54	2,155
20.....	12.70	47,800	8.97	22,350	7.93	17,164	6.34	10,350	4.28	3,940	5.53	2,147
21.....	12.36	45,080	8.69	20,950	7.86	16,828	6.26	10,010	4.35	4,090	5.42	2,065
22.....	11.98	42,040	8.39	19,450	7.75	16,300	6.20	9,800	4.55	4,580	5.51	2,132
23.....	11.02	35,040	8.32	19,100	7.65	15,820	6.13	9,615	4.45	4,325	5.49	2,118
24.....	10.65	32,450	12.87	49,160	7.49	15,074	6.07	9,405	4.68	4,918	5.78	2,335
25.....	10.40	30,700	13.55	54,600	7.33	14,338	6.07	9,405	4.64	4,814	5.80	2,350
26.....	10.46	31,120	12.29	44,520	7.22	13,532	6.02	9,230	5.08	4,000	5.77	2,328
27.....	10.92	34,340	11.49	35,330	7.09	13,236	5.95	8,985	5.59	3,000	5.66	2,245
28.....	11.08	35,460	10.91	34,270	8.01	17,550	6.11	9,545	5.41	2,840	5.63	2,222
29.....	10.78	33,360	10.52	31,540	6.97	12,714	6.09	9,475	5.59	2,790	5.45	2,088
30.....	11.14	35,880	10.43	30,910	6.83	12,140	6.02	9,230	6.09	2,680	5.09	1,895
31.....	12.12	43,320	10.57	31,890	.....	.....	5.96	9,020	.....	.....	4.88	1,790

② Gauge-height for this date is interpolated.

## MONTHLY DISCHARGE of North Saskatchewan River at Prince Albert, for 1912.

(Drainage area, ① square miles)

MONTH.	DISCHARGE IN SECOND-FEET				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	1,576	1,460	1,505	.....	.....	92,545
February.....	1,610	1,550	1,584	.....	.....	91,112
March.....	1,610	1,544	1,579	.....	.....	97,089
April.....	18,750	1,584	9,022	.....	.....	536,848
May.....	15,964	6,110	11,280	.....	.....	693,580
June.....	32,450	6,704	14,864	.....	.....	884,476
July.....	69,880	17,800	35,301	.....	.....	2,170,562
August.....	54,600	19,100	30,044	.....	.....	1,847,328
September.....	44,360	12,140	22,277	.....	.....	1,325,543
October.....	12,180	8,985	10,024	.....	.....	616,288
November.....	8,635	2,328	4,915	.....	.....	292,465
December.....	2,600	1,790	2,315	.....	.....	142,345
The year.....	.....	.....	.....	.....	.....	8,790,181

① Owing to the supply of this stream being for the most part received from the mountains, it was decided not to use results obtained from the drainage area as they would be misleading.



## NORTH SASKATCHEWAN RIVER AT BATTLEFORD.

This station was established May 16, 1911, by H. R. Carscallen. It is located at the traffic bridge in the town of Battleford, on the N.E.  $\frac{1}{4}$  Sec. 29, and the S.W.  $\frac{1}{4}$  Sec. 33, Tp. 43, Rge. 16, W. 3rd Mer. A large island in the river at this point divides the stream into two channels and the river is spanned by two steel bridges, one over each channel. The bridge over the north channel is a five-span steel structure on cement piers and abutments; the south bridge is a three-span steel structure on cement piers and abutments. The two channels necessitate the existence of two gauges, one in each channel.

The gauge in the north channel is of the standard chain type, located on the floor of the bridge at the centre of the left span. The zero of the gauge (elev. 71.87) is referred to a bench mark (assumed elev. 100.00), located on the top of the downstream end of the left abutment.

The gauge in the south channel is of the standard chain type, located on the floor of the bridge at the centre of the right span. The zero of the gauge (elev. 71.02) is referred to the same bench mark as the one on the north channel.

The north channel is straight for about 1500 feet above and 1200 feet below the station. The right bank is high, gravelly and free from brush. The left bank is comparatively low, wooded and will overflow at high stages. The bed of the stream is very sandy and shifts continually. Numerous sand bars appear in the channel at low stages of the stream.

The south channel is straight for about 1500 feet above and 600 feet below the station. The left bank is comparatively low, wooded and will overflow at high stages. The right bank is higher, wooded and not liable to overflow. The bed of the stream is composed of sand and gravel and will shift.

Discharge measurements are made from the downstream side of the bridges. The initial point for soundings for each channel is the north end of the hand rail on the downstream side of the bridge, and distances are marked at every ten feet on the hand rails.

During 1912, gauge height observations were made by Robert Campbell and Harold W. Fisher.

It has been found that, due to the shifting condition of the stream bed, the gauge heights obtained in 1911 cannot be used. During the most of the year the results obtained at this station are very unsatisfactory and during the winter months no reliable records can be obtained from the available data. The results given are very approximate during the winter period.

## DISCHARGE MEASUREMENTS of North Saskatchewan River at Battleford, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 2 and 3.....	① J. C. Keith.....	200.0	251.8	0.97	3.26	243.92
Jan. 4, 5 and 6.....	② do.....	472.0	1,455.8	1.41	3.81	2,060.05
Jan. 2-6.....	③④ do.....	.....	.....	.....	.....	2,303.97
Feb. 1, 2 and 3.....	① do.....	130.0	126.4	1.64	3.55	207.60
Feb. 1, 2 and 3.....	② do.....	436.0	625.0	1.81	4.34	1,133.00
Feb. 1-3.....	③ do.....	.....	.....	.....	.....	1,340.60
Feb. 19.....	④ do.....	170.0	238.0	0.98	3.74	232.80
Feb. 19 and 20.....	⑤ do.....	.....	707.0	1.67	4.53	1,182.00
Feb. 19 and 20.....	⑥ do.....	.....	.....	.....	.....	1,414.80
Apr. 18.....	① H. J. Duffield.....	634.0	1,480.2	1.81	3.85	2,678.91
Apr. 19 and 20.....	② do.....	434.0	2,218.6	2.10	4.35	4,648.15
Apr. 18-20.....	③ do.....	.....	.....	.....	.....	7,327.06
May 25.....	④ G. H. Whyte.....	901.0	3,257.0	1.98	5.15	6,443.62
May 23.....	⑤ do.....	485.0	3,293.2	2.73	6.48	8,992.71
May 23 and 25.....	⑥ do.....	.....	.....	.....	.....	15,436.33
June 4.....	① do.....	866.0	3,034.1	1.78	5.01	5,386.68
June 6.....	② do.....	455.0	2,833.1	2.41	5.54	6,830.76
June 4 and 6.....	③ do.....	.....	.....	.....	.....	12,217.44
June 21.....	④ do.....	1,164.0	6,887.7	2.85	8.58	19,476.95
June 22.....	⑤ do.....	534.0	4,416.6	3.40	9.03	15,006.60
June 21 and 22.....	⑥ do.....	.....	.....	.....	.....	34,483.35
July 3.....	① do.....	1,145.0	5,714.9	2.72	7.44	15,534.39
July 2.....	② do.....	518.0	4,196.7	3.25	7.98	13,632.61
July 2, 3.....	③ do.....	.....	.....	.....	.....	29,167.00
Aug. 7.....	④ do.....	1,053.0	5,184.0	2.23	6.61	11,592.00
Aug. 6.....	⑤ do.....	495.0	3,476.0	3.12	7.26	10,846.00
Aug. 6, 7.....	⑥ do.....	.....	.....	.....	.....	22,438.00
Aug. 31.....	① do.....	1,154.0	6,492.3	2.70	8.14	17,693.80
Aug. 30.....	② do.....	533.0	4,612.0	3.48	9.16	16,049.00
Aug. 30, 31.....	③ do.....	.....	.....	.....	.....	33,742.80
Dec. 2.....	④ do.....	200.0	776.0	1.64	4.40	1,270.00
Dec. 2.....	⑤ do.....	170.0	1,221.0	1.07	5.25	1,303.30
Dec. 2.....	⑥ do.....	.....	.....	.....	.....	2,573.30

① Measurement of North Channel.

② Measurement of South Channel.

③ Total of North and South Channels.

④ This measurement, while probably correct, seems to be too large, and likely was the measurement of the run-off of an ice-jam.

SESSIONAL PAPER No. 25d

DAILY DISCHARGE of North Saskatchewan River at Battleford, for 1912.

DAY.	January.③		February.③		March.③		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
		<i>Sec.-ft.</i>		<i>Sec.-ft.</i>		<i>Sec.-ft.</i>		<i>Sec.-ft.</i>		<i>Sec.-ft.</i>		<i>Sec.-ft.</i>
1.....		1,296	....	1,366	....	1,399	....	3,930	....	5,646	....	11,472
2.....		①1,297	....	1,379	....	1,399	....	4,440	....	5,634	....	16,000
3.....		①1,302	....	1,373	....	1,399	....	4,870	....	5,424	....	17,512
4.....		①1,305	....	1,385	....	1,399	....	4,870	....	5,468	....	15,260
5.....		①1,299	....	1,385	....	1,411	....	6,570	....	5,488	....	13,000
6.....		①1,295	....	1,387	....	1,411	....	7,170	....	5,530	....	11,432
7.....		①1,294	....	1,393	....	1,405	....	10,481	....	8,730	....	10,168
8.....		1,294	....	1,413	....	1,405	....	12,638	....	12,187	....	9,575
9.....		1,301	....	1,413	....	1,405	....	11,802	....	12,053	....	8,724
10.....		1,305	....	1,415	....	1,406	....	11,962	....	12,421	....	8,321
11.....		1,305	....	1,415	....	1,406	....	12,556	....	14,388	....	8,212
12.....		1,295	....	1,415	....	1,406	....	12,222	....	14,655	....	7,250
13.....		1,295	....	1,415	....	1,411	....	11,691	....	14,388	....	6,928
14.....		1,289	....	1,415	....	1,272	....	8,821	....	16,900	....	6,450
15.....		1,250	....	1,415	....	1,272	....	7,664	....	16,960	....	6,195
16.....		1,186	....	1,415	....	1,238	....	7,465	....	15,808	....	9,614
17.....		1,238	....	1,415	....	1,238	....	7,533	....	13,416	....	10,705
18.....		1,238	....	1,415	....	1,238	....	7,836	....	11,309	....	10,300
19.....		1,238	....	1,405	....	1,238	....	6,836	....	9,920	....	11,105
20.....		1,329	....	1,411	....	1,268	....	7,174	....	10,000	....	16,240
21.....		1,319	....	1,380	....	1,268	....	9,094	....	12,628	....	37,196
22.....		1,318	....	1,390	....	1,268	....	12,246	....	15,448	....	33,876
23.....		1,316	....	1,399	....	1,268	....	10,948	....	16,852	....	29,680
24.....		1,259	....	1,399	....	1,268	....	7,994	....	15,664	....	27,908
25.....		1,259	....	1,399	....	1,460	....	8,622	....	13,760	....	27,012
26.....		1,259	....	1,399	....	1,740	....	8,345	....	15,094	....	25,764
27.....		1,257	....	1,399	....	1,770	....	7,581	....	14,862	....	25,868
28.....		1,260	....	1,399	....	1,535	....	6,666	....	12,868	....	27,084
29.....		1,260	....	1,399	....	1,780	....	6,260	....	12,766	....	26,780
30.....		1,249	....	....	....	1,990	....	5,868	....	11,616	....	26,500
31.....		1,389	....	....	....	2,530	....	....	....	10,909	....	....

① The actual measured discharge is greater than discharge shown in the table owing to the fact that ice jams above the station broke away while gauging.

② During January, February and March ice conditions prevailed.

DAILY DISCHARGE of North Saskatchewan River at Battleford, for 1912.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.*	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
		<i>Sec.-ft.</i>		<i>Sec.-ft.</i>		<i>Sec.-ft.</i>		<i>Sec.-ft.</i>		<i>Sec.-ft.</i>		<i>Sec.-ft.</i>
1.....		26,236		30,490		30,810		9,619		6,460		2,280
2.....		26,556		26,780		31,380		9,619		6,300		2,573
3.....		28,220		24,012		30,076		9,366		6,300		2,450
4.....		26,300		22,540		27,028		9,200		6,250		2,300
5.....		22,400		22,268		25,644		9,101		6,300		2,150
6.....		20,340		22,268		23,620		8,930		6,300		2,000
7.....		18,940		22,460		21,804		8,136		5,950		1,980
8.....		18,588		22,668		20,660		8,136		5,860		1,960
9.....		17,272		22,740		19,628		7,844		5,700		1,945
10.....		17,560		26,260		20,260		7,581		4,920		1,930
11.....		46,922		26,900		19,532		7,428		4,700		1,920
12.....		65,716		25,028		18,308		7,615		4,400		1,920
13.....		58,720		21,972		16,948		7,547		4,000		1,910
14.....		49,240		21,052		16,948		7,344		3,900		1,900
15.....		44,500		21,772		17,558		7,736		3,750		1,890
16.....		40,500		22,188		16,192		8,766		3,500		1,880
17.....		39,858		20,972		14,961		8,745		3,300		1,870
18.....		45,808		19,380		14,188		8,447		3,150		1,880
19.....		40,500		18,140		13,890		7,824		2,600		1,890
20.....		33,772		16,672		13,610		7,929		2,200		1,890
21.....		31,212		16,456		12,834		7,929		2,190		1,900
22.....		29,508		55,464		12,145		7,929		2,180		1,900
23.....		26,812		48,200		11,624		7,929		2,150		1,850
24.....		27,404		39,152		11,030		7,963		2,100		1,800
25.....		32,020		30,924		10,657		8,235		2,000		1,800
26.....		31,458		29,440		10,322		8,135		2,000		1,780
27.....		30,498		25,580		9,972		7,649		1,980		1,740
28.....		37,250		28,980		9,707		7,296		1,960		1,760
29.....		42,310		32,772		9,940		7,138		1,930		1,770
30.....		39,224		36,904		10,154		7,138		1,900		1,740
31.....		33,680		34,340				6,856				1,720

\*During December ice conditions prevailed.

## MONTHLY DISCHARGE of North Saskatchewan River at Battleford, for 1912.

(Drainage area, ⑤ square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	1,389	1,186	1,284			78,948
February.....	1,415	1,366	1,400			80,529
March.....	2,530	1,238	1,448			89,036
April.....	12,638	3,930	8,405			500,130
May.....	16,960	5,424	11,900			731,700
June.....	37,196	6,195	16,738			995,980
July.....	65,716	17,272	35,651			2,081,411
August.....	55,464	16,456	27,019			1,661,359
September.....	31,380	9,707	17,381			1,034,320
October.....	9,619	6,856	8,100			498,050
November.....	6,460	1,900	3,874			230,520
December.....	2,573	1,720	1,944			119,534
The year.....						8,101,467

⑤ Owing to the supply of this stream being for the most part received from the mountains, it was decided not to use results obtained from the drainage area as they would be misleading.

## SESSIONAL PAPER No. 25d

## NORTH SASKATCHEWAN RIVER AT EDMONTON.

This station is located at the low-level traffic and railway bridge in the city of Edmonton, on the N.W.  $\frac{1}{4}$  of Sec. 33, Tp. 52, Rge. 24, west of the 4th meridian.

There are two plain staff gauges at the station, a low level one reading from zero to ten feet and a high level one reading from ten to thirty-four feet. The high level gauge is spiked perpendicularly to a high timber pier a short distance above the mill of the Edmonton Lumber Company. The low level gauge is attached to a pier about 75 feet above the other and some 200 feet from the right bank. Both gauges are graduated to feet and tenths and are about 300 yards downstream from the bridge. The zero of the gauges (elevation 1991.085) is referred to a permanent iron bench mark (elevation, 2025.04), located under the stay line to the stack of the mill and about fifty feet from the high level gauge. This bench mark is referred to the Department of Public Works bench mark on the left abutment of the bridge, which is elevation 2025.00 feet above sea level.

The channel is straight for about 700 feet above and 200 feet below the station. Both banks are high, of earth formation and sparsely covered with brush. The bed of the stream is composed of sand and gravel and is liable to shift slightly. The stream is divided into four channels by the three bridge piers.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the stream face of the left or north abutment. Distances are marked on the hand rail of the bridge.

The bridge is a four span steel structure supported by concrete piers and abutments. Between the right pier and the shore, and extending for some distance above and below the bridge, there is a row of timber piers with a long string of booms attached to them. This string of booms is for the purpose of conducting logs to the Edmonton Lumber Company's mill, a short distance below the bridge.

The boom is sometimes full of logs, and at such times it becomes very hard to obtain velocity observations in this span.

This station was first used by this survey during 1911 and the gauge height observation were supplied by the Edmonton Lumber Company. Mr. Schneider made the observations for the Company during 1912.

## DISCHARGE MEASUREMENTS of North Saskatchewan River at Edmonton, for 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
Mar. 22, 23.....	W. H. Greene.....	400.1	1,500.0	1.518	....	2,277.9
May 11, 12.....	H. R. Carscallen.....	431.6	3,628.6	2.610	11.47	9,465.2
June 12, 13.....	do.....	504.6	3,940.7	2.930	12.19	11,550.6
July 12, 13.....	do.....	578.0	5,790.2	3.520	14.92	20,401.8
Aug. 4, 5.....	J. C. Keith.....	577.9	5,639.0	3.670	14.91	20,720.9
Sept. 19, 20.....	do.....	542.3	3,908.5	2.440	11.90	9,533.6
Dec. 22-29.....	do.....	.....	1,418.4	1.090	8.31	1,540.5
Dec. 29, 30.....	do.....	.....	1,605.8	1.040	8.35	1,698.9
1912.						
Jan. 29, 30.....	J. C. Keith.....	417.4	1,503.5	0.94	8.25	1,406.6
Feb. 16.....	do.....	409.7	1,437.0	0.94	8.00	1,351.0
Mar. 23.....	H. J. Duffield.....	392.0	1,303.0	0.79	7.40	1,030.0
April 16.....	do.....	421.9	2,739.8	1.73	8.90	4,751.5
May 18.....	G. H. Whyte.....	567.0	4,812.5	2.95	13.60	14,181.0
June 8.....	do.....	446.0	3,030.8	2.082	10.02	6,310.9
June 26.....	do.....	592.0	6,106.2	4.37	16.02	26,704.4
July 12.....	H. O. Brown.....	597.0	8,416.0	5.245	19.98	44,134.2
July 15.....	do.....	601.4	8,552.2	5.65	20.28	48,314.0
July 15.....	do.....	601.4	8,578.0	5.75	20.28	49,349.0
July 16.....	do.....	598.5	7,456.0	5.49	18.70	40,930.7
Aug. 1.....	G. H. Whyte.....	573.0	5,475.0	4.03	14.94	22,052.0
Aug. 20.....	do.....	602.0	8,805.9	5.14	20.22	45,250.0
Aug. 20.....	do.....	599.0	8,309.0	4.99	19.43	41,490.0
Sept. 24.....	do.....	526.0	3,647.0	2.49	11.385	9,090.0
Dec. 4, 5.....	do.....	436.0	1,871.0	0.57	8.25	1,073.0
Dec. 21.....	F. R. Burfield.....	450.0	1,952.0	0.84	9.07	1,630.0

DAILY GAUGE-HEIGHT AND DISCHARGE of North Saskatchewan River at Edmonton, for 1911.

DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			9.87		10.34	6,908	12.71	12,230	18.13	36,718
2					10.14	6,568	13.83	16,335	21.18	51,205
3					10.19	6,853	14.23	18,192	21.23	51,442
4					10.14	6,568	14.35	18,762	① 19.93	45,268
5					10.19	6,653	14.48	19,380	18.23	37,192
6					10.24	6,738	13.53	15,120	16.93	31,018
7					11.01	8,079	12.73	12,290	15.78	25,555
8					11.79	9,778	12.34	11,135	15.23	22,942
9					11.74	9,665	12.14	10,600	15.68	25,080
10					11.49	9,102	12.14	10,600	16.18	27,455
11					11.24	8,548	12.39	11,272	15.53	24,368
12					11.54	9,215	12.39	11,272	15.03	21,992
13					11.34	8,768	12.19	10,725	14.63	20,062
14					① 10.96	7,988	12.98	13,130	14.03	17,242
15					10.59	7,333	14.78	20,045	13.63	15,520
16					10.34	6,908	15.23	22,942	13.68	15,720
17					10.44	7,078	14.93	21,518	13.93	16,785
18			9.69	②	11.44	8,990	14.73	20,568	① 14.38	18,905
19			10.27		14.98	21,755	14.53	19,617	15.33	23,418
20			11.71		14.23	18,192	14.33	18,668	15.68	23,080
21			10.57		① 13.37	14,495	13.93	16,785	15.43	23,892
22			10.31		12.51	11,630	① 13.60	15,400	① 15.08	22,230
23	8.64	②	① 12.13		11.84	9,890	13.28	14,180	17.18	32,205
24	9.24		13.95		11.64	9,440	13.83	16,335	19.08	41,230
25	9.77		13.05		11.54	9,215	14.78	20,805	17.78	35,055
26	① 10.00		12.55		11.39	8,878	16.28	27,930	16.63	29,592
27	10.24		12.78		11.29	8,658	15.88	26,030	16.43	28,642
28	10.04		11.91		① 11.14	8,334	15.08	22,230	16.68	29,830
29	9.91		10.37		10.99	8,042	15.03	21,992	16.28	27,930
30	10.20		① 10.35		10.84	7,772	15.93	26,268	15.68	25,080
31	10.54				11.24	8,548			15.08	22,230

① Gauge-height interpolated.

② Sufficient data to compute discharges.

## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of North Saskatchewan River at Edmonton, for 1911.  
*Concluded.*

DAY.	August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	15.03	21,992	14.13	17,718	10.98	8,024	8.84	4,692	.....	.....
2.....	14.58	19,855	14.23	18,192	10.98	8,024	8.64	4,432	.....	.....
3.....	14.43	19,142	14.33	18,668	10.98	8,024	8.34	4,042	.....	.....
4.....	14.53	19,617	13.98	17,010	10.98	8,024	8.34	4,042	.....	.....
5.....	14.68	20,330	13.93	16,785	10.98	8,024	8.24	3,912	.....	②
6.....	15.58	24,605	14.33	18,668	10.84	7,772	7.94	3,522	8.94	1,720
7.....	15.38	23,635	13.78	16,120	10.74	7,595	7.74	3,162	8.94	1,720
8.....	16.03	26,742	13.18	13,830	10.64	7,420	7.74	3,162	8.94	1,720
9.....	18.08	36,480	12.73	12,290	10.54	7,248	7.64	3,132	8.94	1,720
10.....	17.63	34,342	12.58	11,840	10.54	7,248	7.64	3,132	①8.89	1,710
11.....	16.33	28,168	12.18	10,700	10.54	7,248	.....	③	8.84	1,700
12.....	15.83	25,792	12.08	10,450	10.54	7,248	.....	.....	8.84	1,700
13.....	15.58	24,605	11.98	10,205	10.54	7,248	.....	.....	8.84	1,700
14.....	15.23	22,942	11.93	10,092	10.44	7,078	.....	.....	8.74	1,660
15.....	14.98	21,755	11.88	9,980	10.34	6,908	.....	.....	8.74	1,660
16.....	14.48	19,380	11.98	10,305	10.24	6,738	.....	.....	8.74	1,650
17.....	14.20	18,050	①11.90	10,025	①10.14	6,568	.....	.....	①8.66	1,640
18.....	13.93	16,785	11.83	9,867	10.04	6,398	.....	.....	8.64	1,620
19.....	13.58	15,320	11.73	9,642	9.94	6,240	.....	.....	8.54	1,600
20.....	13.98	17,010	11.63	9,418	9.84	6,090	.....	.....	8.54	1,580
21.....	16.23	27,692	11.43	8,968	9.64	5,798	.....	.....	8.44	1,560
22.....	20.23	46,692	11.28	8,636	9.54	5,653	.....	.....	8.34	1,500
23.....	18.93	40,518	11.18	8,418	9.44	5,508	.....	.....	8.24	1,480
24.....	17.33	32,918	11.18	8,418	①9.44	5,508	.....	.....	①8.31	1,500
25.....	15.88	26,030	11.18	8,418	9.44	5,508	.....	.....	①8.38	1,650
26.....	15.48	24,130	11.08	8,212	9.39	5,436	.....	.....	8.44	1,700
27.....	15.28	23,180	11.03	8,117	9.34	5,366	.....	.....	8.44	1,700
28.....	15.53	24,368	11.03	8,117	9.34	5,366	.....	.....	8.54	1,750
29.....	14.98	21,755	10.98	8,024	9.24	5,226	.....	.....	8.44	1,670
30.....	①14.58	19,855	10.98	8,024	9.14	5,089	.....	.....	8.34	1,600
31.....	14.38	18,905	.....	.....	8.99	4,887	.....	.....	①7.97	1,380

① Gauge height interpolated.

② No observations from Nov. 11 to Dec. 5.

## DAILY GAUGE-HEIGHT AND DISCHARGE of North Saskatchewan River at Edmonton, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	7.60	1,164	8.30	1,402	7.70	1,198	9.20	2,820	8.90	4,770	12.20	10,750
2.....	7.60	1,164	8.40	1,436	7.70	1,198	9.20	3,080	10.80	7,700	11.80	9,800
3.....	7.70	1,198	8.40	1,436	7.65	①1,181	9.80	3,500	11.80	9,800	10.70	7,525
4.....	7.70	1,198	8.35	①1,419	7.60	1,164	9.80	3,700	11.60	9,350	11.30	8,680
5.....	7.80	1,232	8.30	1,402	7.50	1,130	8.90	3,600	11.80	⑨9,800	11.00	8,060
6.....	7.90	1,266	8.20	1,368	7.55	1,147	8.50	3,610	12.00	10,250	10.60	7,350
7.....	7.90	1,266	8.10	1,364	7.55	1,147	8.50	3,820	13.10	13,550	10.40	7,010
8.....	7.90	1,266	8.10	1,334	7.50	1,130	8.50	4,000	12.90	12,850	10.20	6,670
9.....	7.90	1,266	8.10	1,334	7.70	1,198	8.80	4,240	13.10	13,550	10.00	6,330
10.....	7.90	1,266	8.10	1,334	7.70	①1,198	8.80	④4,450	13.80	16,200	9.90	6,180
11.....	7.90	1,266	8.10	①1,334	7.70	1,198	8.90	4,770	13.60	15,400	11.50	9,125
12.....	7.90	1,266	8.10	1,334	7.65	1,181	8.90	4,770	12.85	12,675	12.20	10,750
13.....	7.90	1,266	8.10	1,334	7.60	1,164	8.90	4,770	12.20	10,750	11.80	9,800
14.....	7.85	①1,249	8.10	1,334	7.55	1,147	8.90	④4,770	11.60	9,350	11.80	9,800
15.....	7.80	1,232	8.10	1,334	7.65	1,181	8.90	4,770	11.60	9,350	12.90	12,850
16.....	7.80	1,232	8.00	1,300	7.65	①1,181	8.90	4,770	12.60	11,900	14.00	17,100
17.....	7.80	1,232	8.00	1,300	7.60	1,164	8.90	4,770	12.70	12,200	17.80	35,150
18.....	7.70	1,198	8.00	①1,300	7.60	1,164	9.50	5,595	13.60	15,400	17.60	34,200
19.....	7.70	1,198	8.00	1,300	7.50	1,130	10.00	6,230	13.60	⑤13,550	17.20	32,300
20.....	7.80	1,232	8.00	1,300	7.40	1,096	10.80	7,700	12.60	11,900	16.60	29,450
21.....	7.85	①1,249	8.00	1,300	7.40	1,096	10.15	⑥6,585	13.10	13,550	16.10	27,075
22.....	7.90	1,266	8.00	1,300	7.40	1,096	9.50	5,595	13.50	15,000	16.00	26,600
23.....	7.90	1,266	8.00	1,300	7.40	1,096	9.00	4,900	12.90	12,850	16.00	26,600
24.....	7.90	1,266	8.00	1,300	7.35	①1,079	8.90	4,770	12.40	11,300	16.10	27,075
25.....	8.00	1,300	8.00	①1,300	7.30	1,062	8.90	4,770	12.30	11,025	16.20	27,550
26.....	7.80	1,232	8.00	1,300	7.50	1,130	8.60	4,280	12.00	10,250	16.20	27,550
27.....	7.81	1,235	7.90	1,266	8.10	①1,609	8.70	4,510	12.3	11,025	16.10	27,075
28.....	8.00	①1,300	7.90	1,266	8.90	2,000	8.60	4,380	12.60	11,900	16.10	27,075
29.....	8.20	1,368	7.80	1,232	9.40	2,330	8.60	4,380	13.60	15,400	16.10	27,075
30.....	8.20	1,368	.....	.....	9.00	2,400	8.90	4,770	13.40	14,600	15.6	24,700
31.....	8.30	1,402	.....	.....	9.10	①2,620	.....	.....	12.80	12,500	.....	.....

① No records; gauge heights interpolated.

② Shifting conditions March 27 to April 10 (inc.)

③ Ice curve used from January 1 to March 27 (inc.)

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of North Saskatchewan River at Edmonton, for 1912.  
*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	15.20	22,800	14.90	21,375	15.40	23,750	11.00	8,060	9.50	5,595	8.30	1,402
2.....	14.40	19,000	15.10	22,325	13.90	16,650	10.70	7,525	9.20	5,170	8.30	1,402
3.....	14.00	17,100	15.20	22,800	14.50	19,475	10.60	7,350	9.30	5,310	8.60	1,504
4.....	13.50	15,000	15.00	21,850	14.20	18,050	10.60	7,350	9.40	5,450	8.50	1,470
5.....	13.50	15,000	15.10	22,325	14.20	18,050	10.50	7,180	9.50	5,595	8.00	1,300
6.....	13.80	16,200	15.90	26,125	14.00	17,100	10.50	7,180	9.50	5,595	7.90	1,266
7.....	15.20	22,800	16.10	27,075	14.20	18,050	10.70	7,525	9.40	5,450	8.40	1,436
8.....	20.20	46,550	15.80	25,650	13.60	15,400	10.70	7,525	9.20	5,170	8.90	1,606
9.....	25.50	71,725	14.80	20,900	13.40	14,600	10.20	6,670	9.20	5,170	9.40	1,776
10.....	26.00	74,100	14.50	19,475	13.70	15,800	10.60	7,350	11.20	① 4,190	9.90	1,946
11.....	22.30	56,525	14.60	19,950	13.50	15,000	11.20	8,460	10.90	3,210	9.90	1,946
12.....	20.20	46,550	15.10	22,325	13.10	13,550	10.90	7,880	10.90	2,220	10.00	1,980
13.....	18.80	39,900	14.50	19,475	14.60	19,950	10.90	7,880	10.90	2,286	9.90	1,946
14.....	19.10	41,325	14.10	17,575	14.60	19,950	10.80	7,700	10.90	2,286	9.40	1,776
15.....	18.50	38,475	13.60	15,400	11.70	9,575	10.80	7,700	10.50	2,150	9.30	1,742
16.....	18.90	40,375	13.20	13,900	12.50	11,600	10.70	7,525	10.70	2,218	9.20	1,708
17.....	17.60	34,200	13.40	14,600	12.20	10,750	10.60	7,350	10.70	2,218	9.10	1,674
18.....	17.30	32,775	13.60	15,400	12.20	10,750	10.60	7,350	10.70	2,218	9.40	1,776
19.....	16.60	29,450	25.20	70,300	11.90	10,025	10.60	7,350	10.30	2,082	9.30	1,742
20.....	16.30	28,025	20.50	47,975	11.40	8,900	10.60	7,350	10.30	2,082	9.60	1,844
21.....	16.60	29,450	18.30	37,525	11.00	*8,060	10.70	7,525	11.00	2,320	9.20	1,708
22.....	17.30	32,775	17.10	31,825	10.90	7,880	10.60	7,350	10.80	2,252	9.20	1,708
23.....	16.90	30,875	16.60	29,450	10.80	7,700	10.50	7,180	10.60	2,184	9.20	1,708
24.....	17.00	31,350	16.40	28,500	11.00	8,060	10.20	6,670	10.40	2,116	9.20	1,708
25.....	18.10	36,575	16.20	27,550	11.10	8,250	10.20	6,670	10.00	1,980	9.20	1,708
26.....	19.2	41,800	16.40	28,500	11.40	8,900	10.10	6,500	10.00	1,980	9.30	1,742
27.....	18.3	37,525	16.20	27,550	10.80	7,700	10.00	6,330	10.00	1,980	9.10	1,674
28.....	17.5	33,725	17.20	32,300	10.80	7,700	9.90	6,180	9.30	1,742	9.10	1,708
29.....	16.6	29,450	17.00	31,350	10.60	7,350	9.80	6,030	8.80	1,572	9.20	1,708
30.....	15.6	24,700	16.90	30,875	10.60	7,350	9.50	5,595	8.60	1,504	9.20	1,708
31.....	15.2	22,800	16.20	27,550	.....	.....	9.00	5,740	.....	.....	9.30	1,742

① Ice jam on Nov. 10. Discharges for Nov. 10, 11, interpolated. Water flowing freely under ice from Nov. 12 to Dec. 31, and ice curve used for that period.



## MONTHLY DISCHARGE of North Saskatchewan River at Edmonton, for 1911-12.

(Drainage area, 10,780 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
May.....	21,755	6,568	9,238	0.857	0.988	568,026
June.....	27,930	10,600	17,412	1.615	1.802	1,036,108
July.....	51,442	15,520	28,094	2.606	3.004	1,727,428
August.....	46,692	15,320	24,600	2.282	2.631	1,512,600
September.....	18,668	8,024	11,502	1.067	1.191	684,418
October.....	8,024	4,887	6,597	0.612	0.706	405,634
November (1-10).....	4,692	3,132	3,723	0.345	0.128	221,537
December (6-31).....	1,750	1,380	1,638	0.152	0.147	88,474
The period.....					10.597	6,244,225
1912						
January.....	1,402	1,164	1,255	0.116	0.134	77,165
February.....	1,436	1,232	1,328	0.123	0.132	76,386
March.....	2,620	1,062	1,316	0.122	0.140	80,916
April.....	7,700	2,820	4,629	0.429	0.479	275,449
May.....	16,200	4,770	11,926	1.106	1.275	733,286
June.....	35,150	6,180	18,242	1.692	1.888	1,085,478
July.....	74,100	15,000	33,900	3.168	3.653	2,100,296
August.....	70,300	13,900	26,444	2.453	2.828	1,625,984
September.....	23,750	7,350	12,864	1.193	1.331	765,476
October.....	8,460	5,595	7,162	0.664	0.765	440,372
November.....	5,595	1,504	3,177	0.295	0.330	189,043
December.....	1,980	1,266	1,650	0.156	0.179	103,300
The year.....					13.134	7,553,151

## BATTLE RIVER AT BATTLEFORD.

This station was established on June 17, 1911 by H. R. Crrsallen. It is located at the traffic bridge in the town of Battleford on the S.E.  $\frac{1}{4}$  Sec. 19, Tp. 43, Rge. 16, W. 3rd Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to the downstream side of a pile, one of a group located at the right bank some 40 feet upream from the bridge. The zero of the gauge (elev. 71.95) is referred to a bench mark (assumed elev. 100.00), on the top of the left abutment on the outer downstream corner.

The channel is straight for 300 yards above and half-a-mile below the station. Both banks are fairly high and clean. The bed of the stream is composed of sand which shifts considerably. Backwater from floods on the North Saskatchewan into which this stream empties some three miles below the station, gives trouble in computing accurate discharges.

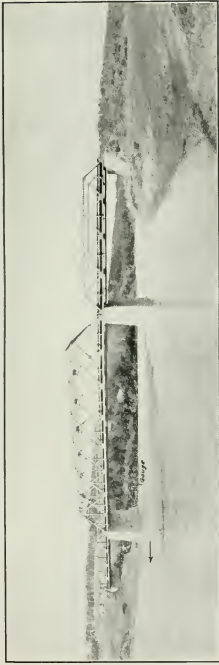
Discharge measurements are made with a current meter from the bridge, which is a three-span steel structure. The initial point for sounding is the inner face of the left abutment. Distances are marked on the hand rail on the downstream side of the bridge.

During 1912, Mr. C. J. Johnson, of the Indian Agency staff, took the observations.

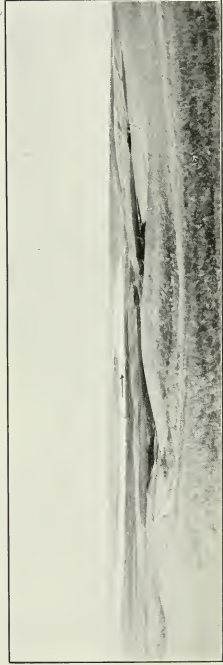
It is impossible to compute daily discharges for 1911 as there were not enough gaugings made during 1911, and conditions were quite different during 1912.

## DISCHARGE MEASUREMENTS of Battle River at Battleford, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 22.....	H. J. Duffield	201.8	624.11	2.10	6.03	1,308.89
May 27.....	G. H. Whyte	164.0	326.0	1.78	4.43	578.65
June 24.....	do	169.0	380.1	1.56	4.62	592.78
Aug. 3.....	do	201.0	714.7	2.54	6.15	1,817.00
Sept. 2.....	do	187.0	529.0	1.91	5.72	1,008.20
Oct. 3.....	do	227.0	464.6	1.95	5.25	905.30
Nov. 29.....	do	189.0	353.3	0.94	5.51	333.93



Traffic Bridge over Battle River at Battleford used as a Gauging Station. Taken by F. H. Peters. PLATE No. 16



Elbow on South Saskatchewan River near proposed Diversion Dam. Taken by F. H. Peters. PLATE No. 17



## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Battle River near Battleford, for 1912.

DAY.	April.		May.		June.		July.		August.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			5.24	842	4.35	502	4.28	560	6.30	1,935
2.....			5.04	748	4.34	499	4.32	585	6.23	1,880
3.....			4.90	695	4.33	496	4.26	570	6.16	1,820
4.....			4.87	684	4.51	558	4.25	570	6.15	1,820
5.....			4.86	681	5.02	739	4.20	560	6.16	1,810
6.....			4.84	674	4.94	709	4.18	555	6.16	1,800
7.....			4.72	632	4.78	649	4.16	555	6.16	1,780
8.....			4.65	606	4.64	604	4.22	580	6.16	1,765
9.....			4.64	604	4.58	583	4.26	600	6.15	1,740
10.....			4.66	611	4.54	569	4.29	610	6.08	1,660
11.....			4.63	602	4.50	555	5.26	1,105	6.08	1,650
12.....			4.59	586	4.58	583	8.98	4,030	6.24	1,760
13.....			4.56	576	4.60	590	7.99	3,240	6.40	1,870
14.....	7.24	2,322	4.54	569	4.58	583	6.16	1,810	6.30	1,775
15.....	8.74	3,522	4.53	566	4.58	583	5.34	1,180	6.27	1,735
16.....	7.19	2,282	4.52	562	4.60	590	5.00	950	6.24	1,695
17.....	5.60	1,055	4.57	580	4.55	572	5.24	1,110	6.19	1,640
18.....	5.57	1,036	4.58	583	4.50	555	5.59	1,370	6.09	1,540
19.....	5.68	1,111	4.62	597	4.50	555	5.22	1,095	5.96	1,430
20.....	5.72	1,140	4.60	590	4.55	572	4.68	780	5.86	1,330
21.....	5.70	1,125	4.58	583	4.62	597	4.54	725	5.78	1,250
22.....	5.99	1,343	4.58	583	4.68	618	4.53	715	7.21	2,350
23.....	5.86	1,245	4.58	583	4.66	611	4.74	810	6.28	1,610
24.....	5.82	1,215	4.55	572	① 4.63	590	4.94	920	5.86	1,270
25.....	5.78	1,185	4.52	562	4.58	595	5.14	1,040	5.64	1,060
26.....	5.73	1,148	4.46	541	4.54	595	5.24	1,110	5.60	1,050
27.....	5.66	1,097	4.40	520	4.50	600	5.32	1,170	5.54	995
28.....	5.56	1,029	4.39	516	4.42	580	5.65	1,420	5.64	1,040
29.....	5.46	966	4.38	513	4.34	565	5.92	1,635	5.74	1,090
30.....	5.36	908	4.36	506	4.29	560	5.95	1,660	5.82	1,130
31.....			4.38	513			6.14	1,810	5.72	1,040

① Shifting conditions from June 24 to Sept. 2.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Battle Creek at Battleford, for 1912.

DAY.	September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.66	990	5.52	1,003	4.70	②	5.47	②
2.....	5.70	1,000	5.54	897	4.49	.....	5.45	.....
3.....	5.72	1,010	5.27	858	4.40	.....	5.43	.....
4.....	5.75	1,090	5.17	806	4.42	.....	5.47	.....
5.....	5.80	1,200	5.13	788	4.44	.....	5.41	.....
6.....	5.85①	1,238	5.13	788	4.36	.....	5.37	.....
7.....	5.86	1,245	5.11	780	4.33	.....	5.33	.....
8.....	5.86	1,245	5.10	775	4.28	.....	5.30	.....
9.....	5.85	1,238	5.09	770	4.34	.....	5.21	.....
10.....	5.80	1,200	5.08	766	4.24	.....	5.22	.....
11.....	5.77	1,177	5.05	752	4.32	.....	5.23	.....
12.....	5.89	1,268	5.03	744	4.61	.....	5.23	.....
13.....	6.02	1,365	5.00	730	4.78	.....	5.25	.....
14.....	6.04	1,380	4.98	723	4.94	.....	5.25	.....
15.....	5.97	1,328	4.95	712	5.26	.....	5.22	.....
16.....	5.94	1,305	4.94	709	5.38	.....	5.21	.....
17.....	5.88	1,260	4.92	702	5.44	.....	5.16	.....
18.....	5.86	1,245	4.91	698	5.29	.....	5.16	.....
19.....	5.88	1,260	4.90	695	5.31	.....	5.15	.....
20.....	5.85	1,238	4.94	709	5.33	.....	5.16	.....
21.....	5.84	1,230	4.98	723	5.32	.....	5.15	.....
22.....	5.82	1,215	4.92	702	5.31	.....	5.15	.....
23.....	5.78	1,185	4.85	678	5.36	.....	5.15	.....
24.....	5.70	1,125	4.82	667	5.44	.....	5.14	.....
25.....	5.65	1,090	4.78	653	5.30	.....	5.14	.....
26.....	5.61	1,062	4.76	646	5.43	.....	5.13	.....
27.....	5.61	1,062	4.73	636	5.40	.....	5.12	.....
28.....	5.61	1,062	4.70	625	5.41	.....	5.12	.....
29.....	5.58	1,042	4.66	611	5.46	.....	5.11	.....
30.....	5.54	1,016	4.62	597	5.46	.....	5.09	.....
31.....	.....	.....	4.59	586	.....	.....	5.07	.....

① Shifting conditions from June 24 to Sept. 6.

② Not sufficient data to compute daily discharge during November and December.

## MONTHLY DISCHARGE of Battle River at Battleford, for 1912.

(Drainage area, 11,850 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (14-30).....	3,522	908	1,396	0.118	0.075	47,070
May.....	842	506	599	0.051	0.059	36,831
June.....	739	496	585	0.049	0.064	34,810
July.....	4,030	555	1,143	0.096	0.110	70,280
August.....	2,350	995	1,560	0.132	0.152	95,920
September.....	1,380	990	1,179	0.099	0.110	70,151
October.....	1,003	586	727	0.061	0.070	44,701
November.....	.....	.....	.....	.....	.....	.....①
December.....	.....	.....	.....	.....	.....	.....②
The period.....	.....	.....	.....	.....	0.630	399,763

① Shifting conditions from June 24 to Sept. 6.

② Not sufficient data to compute daily discharge during November and December.

## SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS made in North Saskatchewan River Drainage Basin, in 1912.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Sec.-ft.</i>
June 20...	Dept. of P.W. ①	Baptiste River...	At mouth.....		285	2.37	674
Aug. 9...	do	do	do		212	1.96	414
Oct. 8...	G.H. Whyte...	Battle River....	N.E. 4-43-25-4...	65	195.6	0.578	113
June 27...	Dept. of P.W. ②	Brazeau River....	Below Little Brazeau.....		1,595	3.35	5,350
Aug. 13...	do	do	do		1,613	2.62	4,233
June 28...	do	do	Ab. Lit. Brazeau		1,255	4.28	5,370
Aug. 14...	do	do	do		1,079	3.83	4,135
June 26...	do	Little Brazeau R...	At mouth.....		214	1.66	356
Aug. 13...	do	do	do		247	1.75	432
June 15...	do	Clearwater River..	Near Rocky Mt. House.....		754	1.14	858
July 29...	do	do	do		956	2.75	2,627
Oct. 10...	G. H. Whyte...	Pigeon Creek....	Sec. 3-46-28-4...	20	10.4	1.19	12.3
June 14...	Dept. of P.W. ③	N'th Sask. River..	At Rocky Mt. House.....		1,752	6.36	11,134
July 31...	do	do	do		2,088	6.83	14,252
Aug. 19...	G. H. Whyte....	Sturgeon River...	At St. Albert....	165	769	0.456	352

① These measurements have been supplied by L. R. Voligny, Dist. Engineer of the Dominion Dept. of Public Works, Prince Albert, Sask.

NOTE.—Width is the actual width of water surface, not including piers. Area of section is the total area of the measured section, including both moving and still water.

## SOUTH SASKATCHEWAN RIVER DRAINAGE BASIN.

*General Description.*

The upper portion of this drainage basin will be dealt with in the descriptions of the drainage basins of Bow, Little Bow, Oldman, Waterton, Belly and St. Mary rivers. These streams are all conjoined at a point known as the Grand Forks, to form the South Saskatchewan river. From the Grand Forks the river flows in a north and easterly direction to its junction with the North Saskatchewan River a short distance east of the city of Prince Albert. From this point onward the stream takes the name of the Saskatchewan River.

After the confluence of the Bow and Belly Rivers the stream receives comparatively little drainage, the principal tributaries being the Red Deer River, draining that portion of the basin between the North and the South Saskatchewan River, and Sevenpersons River and Swiftcurrent Creek, emptying into the main stream from the south. Descriptions of the drainage basins of all these streams are given elsewhere in this report.

The drainage basin of this stream is quite similar to that of all such streams which have their sources in the mountains and flow across the prairies. The upper part of the basin has a good fall, with rock and gravel formation, and a good growth of timber. In contrast to this the prairie section of the basin is sparsely wooded, except along the banks of the stream, and the rock formation changes to earth and the stream is more apt to change its channel, especially in time of flood. The high water occurs in the hot months of summer and is caused by the melting of the snow fields in the mountains. In consequence the low water occurs in the winter months when there is no melting snow to augment the stream flow.

In addition to the gauging stations on the tributaries, and which are taken up in detail elsewhere in this report, there were two stations established on the main stream during the season of 1911, and daily gauge height observations and discharge measurements have since been taken at regular intervals. These stations are located at the cities of Medicine Hat and Saskatoon.

During 1912, the city of Saskatoon completed a filtration plant which is one of the most modern in America. This enables them to obtain a pure supply of water from the South Saskatchewan River.

## SOUTH SASKATCHEWAN RIVER AT SASKATOON.

This station was established May 27, 1911, by H. R. Carscallen. It is located at the Canadian Northern railway bridge in the city of Saskatoon, on the S. W.  $\frac{1}{4}$  Sec. 28, Tp. 36, Rge. 5, W. 3rd Mer.

The gauge, which is of the standard chain type, is placed on the downstream side of the bridge at chainage 190. The length of chain from the bottom of the weight to the marker is 44.10 feet. The zero of the gauge (elev. 61.81) is referred to a bench mark (assumed elev. 100.00) on the top of the downstream end of the left abutment.

The channel is straight for about 500 feet above and 800 feet below the station. Both banks are high and sandy. The right bank is covered with a dense growth of trees and brush above and below the station. The left bank is clear of brush. The bed of the stream is sandy and shifts.

Discharge measurements are made from the bridge, which is a six-span timber structure supported by cement piers and abutments. The remains of the piers of a former bridge affect velocity observations in their vicinity. In March, 1912, the left span of the bridge was destroyed and a temporary pile trestle erected. During the highwater period, the flow through this span was difficult to estimate but there was no low water flow as the span became blocked with debris. Distances are marked on the hand rail on the downstream side of the bridge. The face of the left abutment is the initial point for sounding.

During 1912, observations of gauge height were made twice each day. From January to October F. Cartwright made the observations, and for the balance of the year they were made by James White.

#### DISCHARGE MEASUREMENTS of South Saskatchewan River at Saskatoon, for 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
May 27.	H. R. Carscallen	744.2	5,916	4.48	7.32	26,535
June 20.	do	788.7	7,688	5.34	9.41	41,054
July 20, 21.	do	716.7	5,451	4.21	6.68	22,928
Aug. 16, 17.	J. C. Keith	795.7	7,830	5.38	9.77	42,162
Sept. 28, 29.	do	640.8	4,317	3.24	5.17	13,953
Nov. 22.	do		2,095	1.40	2.77	2,942
Dec. 12, 13.	do		2,098	2.19	3.44	4,508
1912.						
Jan. 9, 10.	do		1,404.2	0.98	1.75	1,382.3
Feb. 6, 7.	do	385.3	1,493.5	1.47	2.81	2,196.5
Feb. 22, 23.	do	377	1,540	1.49	2.98	2,295.7
April 25.	H. J. Duffield	478.8	3,449.3	2.97	3.60	10,254.9
May 29.	G. H. Whyte	707	4,891.5	4.385	6.58	21,450.0
June 15.	do	527.5	3,893.6	3.54	4.50	13,795.8
July 5, 6.	do	647	5,358.7	4.443	6.43	23,810.3
July 18.	do	745	7,773	6.162	10.25	47,898.0
Aug. 15.	do	657	5,072	3.83	6.23	19,425.0
Aug. 28.	do	606	5,160	4.05	5.84	20,694.0
Oct. 2.	do	514	3,369	2.99	3.65	10,068.0
Nov. 7.	do	540	3,580	2.62	3.52	9,303.3
Nov. 25.	do				2.88	9,450
Nov. 27.	do				1.72	9,4240

① Ice running in stream made it impossible to make measurement but discharge would not be affected by ice conditions. Discharge is estimated from summer curve.

## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of South Saskatchewan River at Saskatoon, for 1911.

DAY.	May.		June.		July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			6.6	22,200	10.2	45,900	6.3	20,450
2.....			6.4	21,000	10.3	46,600	6.4	21,000
3.....			6.2	19,900	9.9	43,800	6.3	20,450
4.....			6.0	18,800	9.5	41,000	6.2	19,900
5.....			5.9	18,250	9.4	40,300	6.1	19,350
6.....			5.9	18,250	9.4	40,300	6.0	18,800
7.....			6.0	18,800	8.9	36,800	5.9	18,250
8.....			6.3	20,450	8.7	35,400	5.8	17,700
9.....			6.5	21,600	8.6	34,700	5.8	17,700
10.....			8.6	34,700	8.7	35,400	5.7	17,150
11.....			9.6	30,050	8.1	31,350	5.6	16,600
12.....			9.2	36,800	7.6	28,200	5.6	16,600
13.....			8.7	35,400	6.7	22,800	6.0	18,800
14.....			8.2	32,000	6.6	22,200	6.1	19,350
15.....			8.0	30,700	6.5	21,600	7.6	28,200
16.....			7.9	41,700	6.5①	21,600	9.8	43,100
17.....			8.9	38,900	6.5①	21,600	9.9	43,800
18.....			8.7	35,400	6.6①	22,200	9.3	39,600
19.....			8.7	35,400	6.6①	22,200	8.7	35,400
20.....			8.8	36,100	6.66	22,560	8.1	31,350
21.....			9.7	42,400	6.5①	21,600	7.6	28,200
22.....			9.7	42,400	6.4	21,000	7.4	27,000
23.....			9.6	41,700	6.2	19,900	7.1	25,200
24.....			9.7	42,400	6.2	19,900	6.9	24,200
25.....			9.7	42,400	6.1	19,350	6.6	26,200
26.....			9.8	43,100	6.3	20,450	6.5	21,600
27.....	①		9.1	38,200	6.2	19,900	6.6	22,200
28.....	7.0	24,600	9.1	38,200	6.2	19,900	6.2	19,900
29.....	6.1	19,350	8.9	36,800	6.2	19,900	6.0	18,800
30.....	6.9	24,000	9.4	40,300	6.2	19,900	5.8	17,700
31.....	6.7	22,800			6.2	19,900	5.9	18,250

① Station established.

② Gauge-height interpolated.



DAILY GAUGE-HEIGHT AND DISCHARGE of South Saskatchewan River at Saskatoon, for 1911.  
*Concluded.*

DAY.	September.		October.		November.		December.	
	Gauge.	Dis-	Gauge.	Dis-	Gauge.	Dis-	Gauge.	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	6.1	19,350	5.0	13,400	.....	.....	2.25	2,025
2	5.9	18,250	4.9	12,900	.....	.....	2.40	2,250
3	5.8	17,700	4.8	12,400	.....	.....	2.78	2,560
4	5.7	17,150	4.7	11,950	.....	.....	3.00	3,500
5	5.6	16,600	4.6	11,500	.....	.....	3.40	4,500
6	5.5	16,050	4.5	10,050	.....	.....	3.60	5,000
7	5.4	15,500	4.3	10,200	.....	.....	3.78	5,450
8	5.3	14,950	4.1	9,400	.....	.....	3.75	5,375
9	5.1	13,900	4.0	9,000	.....	.....	3.73	5,325
10	4.9	12,900	3.9	8,600	.....	.....	3.72	5,300
11	4.7	11,950	3.8	8,200	.....	.....	3.38	4,450
12	6.9	24,000	3.7	7,850	.....	.....	3.47	4,675
13	7.8	29,400	3.6	7,500	.....	.....	3.38	4,450
14	8.7	35,400	3.3	6,500	.....	.....	3.25	4,125
15	8.4	33,300	3.0	5,600	.....	.....	3.28	4,200
16	7.9	30,050	2.7	4,700	.....	.....	3.25	4,125
17	7.7	28,800	2.4	3,900	.....	.....	3.45	4,625
18	7.3	26,400	2.2	3,400	.....	.....	3.45	4,625
19	6.9	24,000	2.0	3,000	①	.....	3.45	4,625
20	6.8	23,400	②	.....	3.02	3,550	3.45	4,625
21	6.7	22,800	.....	.....	2.86	3,150	3.40	4,500
22	6.5	21,600	.....	.....	2.68	2,760	3.25	4,125
23	6.3	20,450	.....	.....	2.65	2,700	3.22	4,050
24	6.2	19,900	.....	.....	2.50	2,400	3.20	4,000
25	6.0	18,800	.....	.....	2.45	2,325	3.14	3,850
26	5.7	17,150	.....	.....	2.34	2,160	2.30	2,100
27	5.6	16,600	.....	.....	2.19	1,936	2.50	2,400
28	5.5	16,050	.....	.....	2.24	2,010	2.85	3,125
29	5.2	14,400	.....	.....	2.16	1,900	2.75	2,900
30	5.1	13,900	.....	.....	2.15	1,888	2.70	2,800
31	.....	.....	.....	.....	.....	.....	2.40	2,250

① Rod washed out.

② Chain gauge established.

## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of South Saskatchewan River at Saskatoon, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.45	2,325	2.75	2,112	3.30	2,525	3.04	2,330	3.38	9,230	6.54	24,040
2.....	2.35	2,175	2.80	2,150	3.30	2,525	3.06	2,345	3.28	8,880	6.57	24,220
3.....	2.33	2,145	2.90	2,225	3.30	2,525	3.13	2,398	3.25	8,775	6.37	23,050
4.....	1.90	1,575	2.90	2,225	3.22	2,465	3.21	2,458	3.30	8,950	6.17	22,050
5.....	1.70	1,350	2.90	2,225	3.20	2,450	3.43	2,630	3.39	9,265	6.33	22,850
6.....	1.75	1,400	2.90	2,225	3.20	2,450	3.51	2,710	3.30	8,950	6.37	23,050
7.....	1.80	1,450	2.81	2,158	3.20	2,450	①	10,000	3.30	8,950	6.25	22,450
8.....	1.75	1,400	2.90	2,225	3.20	2,450	①	20,000	3.25	8,775	6.05	21,450
9.....	1.75	1,400	2.90	2,225	3.18	2,435	8.75	37,300	3.19	8,565	5.87	20,550
10.....	1.75	1,375	2.90	2,225	3.18	2,435	7.26	28,360	3.13	8,355	5.51	18,750
11.....	1.70	1,350	2.95	2,262	3.15	2,412	6.77	25,420	3.13	8,355	5.34	17,900
12.....	1.70	1,350	3.05	2,338	3.15	2,412	6.53	23,980	3.32	9,020	5.10	16,700
13.....	1.70	1,350	3.10	2,375	3.15	2,412	6.47	23,620	3.72	10,480	4.95	15,950
14.....	1.70	1,350	3.15	2,412	3.15	2,412	6.70	25,000	4.16	12,240	4.75	14,950
15.....	1.70	1,350	3.15	2,412	3.15	2,412	6.17	22,050	4.50	13,700	4.57	14,050
16.....	1.85	1,438	2.90	2,225	2.95	2,262	5.50	18,700	4.81	15,250	4.53	13,850
17.....	1.80	1,400	2.95	2,262	2.95	2,262	5.24	17,400	4.79	15,150	4.36	13,100
18.....	1.95	1,512	2.95	2,262	2.90	2,225	4.88	15,600	4.86	15,500	4.31	12,850
19.....	2.15	1,662	2.90	2,225	2.80	2,150	4.70	14,700	5.15	16,950	4.46	13,540
20.....	2.20	1,700	2.90	2,225	2.70	2,075	4.69	14,650	5.18	17,100	4.80	15,200
21.....	2.20	1,700	3.10	2,375	2.60	2,000	4.67	14,550	5.00	16,200	5.13	16,850
22.....	2.35	1,812	2.96	2,270	2.60	2,000	4.44	13,460	4.82	15,300	5.33	17,850
23.....	2.35	1,812	3.02	2,315	2.68	2,060	4.10	12,000	4.85	15,450	7.75	31,900
24.....	2.40	1,850	3.02	2,315	2.70	2,075	3.84	10,960	5.50	18,700	8.59	36,340
25.....	2.45	1,888	3.10	2,375	2.75	2,112	3.71	10,440	6.15	21,950	9.87	44,790
26.....	2.53	1,948	3.15	2,412	2.70	2,075	3.65	10,200	6.44	23,440	9.25	40,450
27.....	2.60	2,000	3.27	2,502	2.75	2,112	3.73	10,520	6.66	24,760	8.75	37,300
28.....	2.65	2,038	3.30	2,525	2.90	2,225	3.72	10,480	6.59	24,340	8.35	34,900
29.....	2.65	2,038	3.30	2,525	2.95	2,262	3.72	10,480	6.60	24,400	8.10	33,400
30.....	2.65	2,038	.....	.....	3.05	2,338	3.55	9,825	6.70	25,000	7.93	32,380
31.....	2.70	2,075	.....	.....	3.15	2,412	.....	.....	6.68	24,880	.....	.....

DAILY GAUGE-HEIGHT AND DISCHARGE of South Saskatchewan River at Saskatoon, for 1912.  
*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	7.71	31,060	8.31	34,660	5.25	17,450	3.70	10,400	3.43	9,405	1.93	①
2.....	7.60	30,400	9.66	43,320	5.17	17,050	3.65	10,200	3.40	9,300	1.97	.....
3.....	7.31	28,660	9.15	39,750	5.24	17,400	3.61	10,040	3.33	9,055	2.06	.....
4.....	7.04	27,040	8.43	35,380	5.60	19,200	3.70	10,400	3.30	8,950	2.09	.....
5.....	6.97	26,620	8.05	33,100	6.01	21,250	3.60	10,000	3.53	9,755	2.19	.....
6.....	7.00	26,800	7.72	31,120	6.07	21,550	3.60	10,000	3.47	9,545	2.65	.....
7.....	6.83	25,780	7.34	28,840	5.98	21,100	3.54	9,790	3.44	9,440	2.90	.....
8.....	6.67	24,820	7.00	26,800	6.00	21,200	3.53	9,755	3.11	8,285	2.73	.....
9.....	6.74	25,240	6.67	24,820	5.76	20,000	3.49	9,615	3.00	7,900	2.22	.....
10.....	6.55	24,100	6.52	23,920	5.64	19,400	3.34	9,090	3.07	8,145	2.34	.....
11.....	6.45	23,500	6.36	23,000	5.43	18,350	3.27	8,845	3.17	8,495	2.45	.....
12.....	6.50	23,800	6.34	22,900	5.00	16,200	3.22	8,670	2.85	7,375	2.34	.....
13.....	6.43	23,380	6.30	22,700	4.96	16,000	3.19	8,565	2.81	7,235	2.19	.....
14.....	6.53	23,980	6.32	22,800	4.85	15,950	3.19	8,565	2.91	7,585	2.55	.....
15.....	7.59	30,340	6.26	22,500	4.97	16,050	3.18	8,530	2.80	7,200	2.67	.....
16.....	10.39	48,430	6.18	22,100	5.01	16,250	3.22	8,670	2.68	6,840	2.88	.....
17.....	10.66	50,320	6.03	21,350	4.94	15,900	3.26	8,810	2.85	7,375	2.95	.....
18.....	10.21	47,170	5.82	20,300	5.05	16,450	3.31	8,985	2.78	7,140	3.00	.....
19.....	9.89	44,930	5.54	18,900	5.49	18,650	3.35	9,125	2.75	7,050	3.40	.....
20.....	9.71	43,670	5.42	18,300	5.35	17,950	3.35	9,125	2.72	6,960	3.70	.....
21.....	10.00	45,700	5.24	17,400	4.97	16,050	3.38	9,230	2.65	6,750	3.85	.....
22.....	10.26	47,520	5.25	17,450	4.77	15,050	3.44	9,440	2.65	6,750	3.99	.....
23.....	9.63	43,110	5.06	16,500	4.87	14,050	3.39	9,265	2.67	6,810	4.17	.....
24.....	9.21	40,170	5.00	16,200	4.37	13,150	3.45	9,475	2.95	7,725	4.22	.....
25.....	8.65	36,700	4.97	16,050	4.31	12,850	3.44	9,440	2.89	7,515	4.11	.....
26.....	8.21	34,060	4.95	15,950	4.14	12,160	3.34	9,090	2.70	6,900	3.78	.....
27.....	8.02	32,920	5.54	18,900	3.93	11,320	3.31	8,985	1.73	4,260	3.79	.....
28.....	7.84	31,840	5.94	20,900	3.90	11,200	3.30	8,950	1.67	4,140	3.82	.....
29.....	8.00	32,800	5.89	20,650	3.83	10,920	3.29	8,915	1.72	4,240	3.97	.....
30.....	8.10	33,400	5.58	19,100	3.77	10,680	3.26	8,810	1.75	4,300	3.95	.....
31.....	8.10	33,400	5.45	18,450	.....	.....	3.40	9,300	.....	.....	3.34	.....

① Not sufficient data to compute discharges.

## SESSIONAL PAPER No. 25d

## MONTHLY DISCHARGE of South Saskatchewan River at Saskatoon, for 1911-12.

(Drainage area, ① square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
May (28-31).....	24,600	19,350	22,688			150,004
June.....	43,100	18,250	32,477			1,932,520
July.....	46,600	19,350	27,684			1,702,224
August.....	43,800	16,600	23,503			1,445,183
September.....	35,400	11,950	20,357			1,211,320
October (1-19).....	13,400	3,000	8,476			319,426
November (20-30).....	3,550	1,888	2,434			53,105
December.....	5,450	2,025	3,945			242,570
The period.....						7,086,352
1912						
January.....	2,325	1,350	1,686			103,666
February.....	2,525	2,112	2,297			132,124
March.....	2,525	2,000	2,304			141,668
April.....	37,300	2,330	14,152			842,120
May.....	25,000	8,355	14,737			906,157
June.....	44,790	12,850	23,204			1,380,736
July.....	50,320	23,380	33,602			2,066,122
August.....	43,320	15,950	23,681			1,456,122
September.....	21,550	10,680	16,359			973,440
October.....	10,400	8,530	9,293			571,403
November.....	9,755	4,140	7,414			441,166
December ①.....						
The period.....						9,014,724

① Owing to the supply of this stream being for the most part received from the mountains, it was decided not to give the discharge per square mile of the area or the run-off in inches. Such figures would give an erroneous idea of the run-off as the mountains form only a small part of the whole basin.

② Not sufficient data to compute discharges for December.

## SOUTH SASKATCHEWAN RIVER AT MEDICINE HAT.

This station was established May 31, 1911, by H. R. Carscallen. It is located at the traffic bridge in the city of Medicine Hat on the N. W.  $\frac{1}{4}$  Sec. 31, Tp. 12, Rge. 5, W. 4th Mer. The bridge is a five-span structure supported by concrete abutments and piers.

The gauge is a plain staff graduated to feet and hundredths, fixed to the upper pier of the swing span of the Canadian Pacific Railway bridge about 200 yards below the traffic bridge. The gauge is spiked to the shore face of the pier. The zero of the gauge (elev. 79.78) is referred to a permanent iron bench mark (assumed elev. 100.00), located on the bank of the river directly opposite the gauge and 40 feet from the upstream side of the Canadian Pacific Railway Company's pump house.

The channel is straight for about 600 yards above and below the station. The current is moderate and uniform, except in the vicinity of the piers. At these points eddies, and in some cases stretches of backwater occur, making it difficult to obtain the mean velocity. The banks are high and sandy and clear of undergrowth. The bed is composed of sand and gravel and is liable to shift at high stages of the stream.

Open water measurements are made from the traffic bridge. The initial point for soundings is the stream face of the left, or west, abutment and is suitably marked on the handrail.

During 1912, the gauge was read by Alfred Webber, John Morris and B. H. Solomon.

## DISCHARGE MEASUREMENTS of South Saskatchewan River at Medicine Hat, for 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
Feb. 25.....	H. R. Carscallen.....	314.4	2,045.69	0.77	.....	1,573.64
May 31.....	do.....	643.3	4,968.93	2.94	.....	14,628.62
June 24-26.....	do.....	782.6	6,870.43	4.27	8.35	29,342.73
June 26, 27.....	do.....	820.7	7,863.21	4.88	9.20	38,335.52
July 24, 25.....	do.....	621.2	4,822.1	2.76	4.97	13,321.91
Sept. 8, 9.....	J. C. Keith.....	773.4	6,649.42	4.04	7.72	26,898.71
Oct. 30, 31.....	do.....	475.7	3,198.33	1.46	2.485	4,659.69
Dec. 4.....	D. D. MacLeod.....	416.8	3,601.8	1.214	1.25	3,645.9
Dec. 18.....	do.....	580.0	2,927.0	0.90	2.95	2,637.7
1912.						
Jan. 25.....	D. D. MacLeod.....	540.0	2,445.0	0.78	3.01	1,922.0
Feb. 12.....	do.....	540.0	2,480.0	0.71	2.98	1,742.0
Feb. 26.....	do.....	530.0	2,517.0	0.80	3.11	2,025.0
Mar. 13.....	do.....	520.0	2,340.0	0.68	2.70	1,566.0
April 15.....	do.....	582.0	3,587.0	2.07	3.17	7,377.0
May 3.....	do.....	563.0	3,608.0	1.67	2.96	6,024.0
May 15.....	do.....	540.0	4,177.0	2.30	4.08	9,629.0
May 29.....	do.....	675.0	5,257.0	3.26	5.71	17,111.0
June 17.....	H. D. Smith.....	682.0	5,200.0	3.41	5.81	17,721.0
Aug. 5.....	do.....	650.0	4,791.0	3.25	5.35	15,200.0
Aug. 21.....	do.....	665.0	4,590.0	2.42	4.87	11,107.0
Sept. 6.....	do.....	540.0	4,051.0	1.81	3.98	7,371.0
Sept. 18.....	do.....	519.0	3,952.0	1.95	3.64	7,706.0
Oct. 4.....	do.....	495.0	3,676.0	1.70	2.90	6,260.0
Oct. 30.....	do.....	474.0	3,412.0	1.85	2.98	6,310.0
Nov. 2.....	do.....	560.0	3,325.0	1.57	2.64	5,534.0
Nov. 18.....	do.....	561.0	3,530.0	1.48	2.62	4,917.0
Dec. 13.....	H. O. Brown.....	494.0	3,307.0	0.77	3.09	2,381.0
Dec. 27.....	do.....	461.0	2,869.5	0.76	2.49	2,188.0

## DAILY GAUGE-HEIGHT AND DISCHARGE of South Saskatchewan River at Medicine Hat, for 1911.

DAY.	June.		July.		August.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	5.15	14,250	8.34	32,600	5.05	13,750
2.....	5.80	17,540	8.29	32,275	5.00	13,500
3.....	6.65	22,260	8.49	33,575	5.00	13,500
4.....	8.20	31,690	8.39	32,925	5.40	15,500
5.....	8.85	35,915	8.39	32,925	5.40	15,500
6.....	9.0	36,890	8.44	33,250	5.40	15,500
7.....	9.05	37,215	8.49	33,575	5.45	15,750
8.....	8.10	31,040	8.49	33,575	5.90	18,080
9.....	7.85	29,420	8.49	33,575	6.50	21,420
10.....	7.7	28,500	8.49	33,575	7.20	25,500
11.....	7.65	28,200	8.34	32,600	7.20	25,500
12.....	7.65	28,200	8.34	32,600	7.20	25,500
13.....	7.65	28,200	8.29	32,275	7.10	24,900
14.....	8.15	31,365	8.29	32,275	6.50	21,420
15.....	8.15	31,365	8.29	32,275	6.35	20,580
16.....	9.35	39,165	8.29	32,275	6.20	19,740
17.....	9.35	39,165	7.24	25,740	6.00	18,620
18.....	9.4	39,490	7.19	25,440	5.90	18,080
19.....	9.5	40,140	7.19	25,440	5.90	18,080
20.....	9.45	19,815	7.19	25,440	5.90	18,080
21.....	9.45	39,815	7.14	25,140	5.90	18,080
22.....	9.50	40,140	6.59	21,924	5.80	17,540
23.....	8.55	33,965	5.51	18,050	5.70	17,010
24.....	8.0	30,390	5.00	13,500	5.70	17,010
25.....	9.2	38,190	5.00	13,500	5.70	17,010
26.....	8.9	36,240	5.00	13,500	5.70	17,010
27.....	9.3	38,840	5.00	13,500	.....	①
28.....	8.69	34,875	5.00	13,500	.....	.....
29.....	8.29	32,275	5.10	14,000	.....	.....
30.....	8.29	32,275	5.10	14,000	.....	.....
31.....	.....	.....	5.05	13,750	.....	.....

① No observations.

## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of South Saskatchewan River at Medicine Hat, for 1911.  
*Concluded.*

DAY.	September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....		①		①	2.45	4,945	3.54	4,562
2.....					2.58	4,784	3.47	4,331
3.....					2.50	5,060	3.36	3,968
4.....					2.18	4,360	3.27	3,671
5.....					2.35	4,715	3.30	3,770
6.....					2.55	5,175	3.38	4,034
7.....					2.65	5,405	3.29	3,737
8.....					2.80	5,760	3.41	4,133
9.....					3.40	4,100	3.40	4,100
10.....					3.00	2,800	3.27	3,671
11.....					2.25	1,115	3.23	3,539
12.....					2.20	1,030	3.06	2,992
13.....					2.50	1,580	3.04	2,928
14.....					2.60	1,790	3.03	2,896
15.....					2.50	1,580	3.00	2,900
16.....					2.60	1,790	3.10	3,120
17.....					2.48	1,542	2.95	2,650
18.....					2.42	1,428	2.87	2,416
19.....					2.45	1,485	2.59	1,769
20.....					3.20	3,440	2.45	1,485
21.....					3.15	3,280	2.48	1,542
22.....					3.75	5,255	2.27	1,149
23.....					4.20	6,770	2.27	1,149
24.....					4.35	7,280	2.30	1,200
25.....					4.50	7,790	2.08	878
26.....					4.42	7,518	2.00	790
27.....					4.35	7,280	1.98	772
28.....					4.26	6,974	2.10	900
29.....					3.91	5,784	2.05	845
30.....					3.68	5,024	2.05	845
31.....							2.09	889

① No observations.

## DAILY GAUGE-HEIGHT AND DISCHARGE of South Saskatchewan River at Medicine Hat, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.20	1,080	3.20	2,140	3.10	2,020	.....	①	.....	.....	5.75	17,275
2.....	2.23	1,104	3.28	2,244	3.06	1,972	.....	.....	.....	.....	5.51	16,050
3.....	2.18	1,064	3.29	2,257	3.05	1,960	.....	.....	2.92	6,056	5.25	14,750
4.....	2.12	1,016	3.26	2,218	3.02	1,924	.....	.....	2.97	6,196	5.05	13,750
5.....	2.30	1,160	3.26	2,218	2.95	1,840	.....	.....	3.40	7,420	4.87	12,918
6.....	2.50	1,350	3.27	2,231	2.95	1,840	.....	.....	3.45	7,565	4.73	12,302
7.....	2.65	1,500	3.30	2,270	2.85	1,720	.....	.....	3.43	7,507	4.63	11,889
8.....	2.85	1,720	3.20	2,140	2.80	1,660	.....	.....	3.40	7,420	4.46	11,156
9.....	2.84	1,708	3.05	1,960	2.78	1,638	.....	.....	3.35	7,275	4.33	10,623
10.....	2.80	1,660	3.06	1,972	2.74	1,594	3.52	7,772	3.27	7,043	4.22	10,172
11.....	2.88	1,756	3.05	1,960	2.74	1,594	3.31	7,159	3.30	7,130	4.15	9,905
12.....	2.70	1,550	2.98	1,776	2.72	1,572	3.00	6,280	4.00	9,360	4.42	10,992
13.....	2.77	1,627	2.99	1,888	2.70	1,550	2.99	6,252	4.10	9,270	4.73	12,302
14.....	2.77	1,627	3.05	1,960	2.76	1,616	3.22	6,898	4.08	9,648	5.00	13,500
15.....	2.70	1,550	3.10	2,020	2.78	1,638	3.32	7,188	4.05	9,540	5.20	14,500
16.....	2.90	1,780	3.25	2,205	2.80	1,660	3.15	6,705	4.10	9,720	5.36	15,300
17.....	2.90	1,780	3.48	2,504	2.80	1,660	3.10	6,560	4.12	9,794	5.82	17,648
18.....	2.80	1,660	3.45	2,465	2.82	1,684	3.04	6,392	5.10	14,000	7.34	39,100
19.....	2.82	1,684	3.41	2,413	2.84	1,708	2.99	6,252	5.85	17,810	9.45	39,815
20.....	2.86	1,723	3.27	2,231	2.84	1,708	.....	①	6.05	18,900	8.50	33,640
21.....	2.95	1,840	3.20	2,140	2.88	1,756	.....	.....	5.95	18,350	7.96	30,130
22.....	3.00	1,900	3.18	2,116	2.90	1,780	.....	.....	5.90	18,080	7.52	27,420
23.....	3.05	1,960	3.19	2,128	2.96	1,852	.....	.....	6.25	20,020	7.24	25,740
24.....	3.12	2,044	3.18	2,116	3.02	1,924	.....	.....	6.15	19,460	7.04	24,540
25.....	3.05	1,960	3.18	2,116	.....	①	.....	.....	5.95	18,350	6.90	23,700
26.....	2.91	1,792	3.16	2,092	.....	.....	.....	.....	5.83	17,702	6.70	22,540
27.....	2.90	1,780	3.10	2,020	3.80	2,940	.....	.....	5.97	18,458	6.54	21,644
28.....	3.03	1,936	3.10	2,020	.....	.....	.....	.....	5.75	17,275	6.35	20,580
29.....	3.10	2,020	3.14	2,068	.....	.....	.....	.....	5.73	17,169	6.25	20,020
30.....	3.12	2,044	.....	.....	.....	.....	.....	.....	5.94	18,296	6.20	19,740
31.....	3.22	2,166	.....	.....	.....	.....	.....	.....	5.97	18,458	.....	.....

① Observer unable to get out to rod, on March 27 a reading was taken from shore.

② Rod out on April 1, replaced April 10.

③ Rod removed by C. P. R. April 25, replaced May 3.

## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of South Saskatchewan River at Medicine Hat, for 1912.  
*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	6.25	20,020	6.00	18,620	4.90	13,050	3.00	6,280	2.86	5,904	2.01	2,980
2.....	6.07	19,012	5.74	17,222	4.83	12,742	3.00	6,280	2.66	5,428	1.42	2,960
3.....	6.01	18,676	6.44	21,084	4.54	11,488	2.96	6,168	2.65	5,405	1.47	3,040
4.....	6.00	18,620	5.35	15,250	4.45	11,115	2.90	6,000	2.61	5,313	2.04	2,900
5.....	5.94	18,296	5.35	15,250	4.14	9,868	2.85	5,880	2.62	5,336	2.07	2,800
6.....	6.12	19,292	5.36	15,300	3.98	9,288	2.83	5,832	2.67	5,451	2.27	2,700
7.....	5.90	18,080	5.34	15,200	3.90	9,000	2.80	5,760	2.71	5,544	1.52	2,650
8.....	5.22	14,600	5.35	15,250	3.88	8,932	2.80	5,760	2.67	5,451	2.92	2,600
9.....	6.05	18,900	5.24	14,700	4.03	9,468	2.82	5,808	2.61	5,313	1.85	2,550
10.....	6.55	21,700	5.10	14,000	4.00	9,360	2.90	6,000	2.52	5,106	3.02	2,500
11.....	8.05	30,715	4.90	13,050	3.96	9,216	2.95	6,140	2.61	5,313	3.19	2,450
12.....	7.91	29,805	4.65	11,955	3.90	9,000	2.95	6,140	2.51	5,083	3.04	2,400
13.....	6.50	21,420	4.50	11,320	3.85	8,830	2.95	6,140	2.61	5,313	3.17	2,390
14.....	6.05	18,900	4.50	11,320	3.83	8,762	2.95	6,140	2.52	5,106	3.17	2,390
15.....	6.00	18,600	4.53	11,446	3.75	8,495	2.95	6,140	2.69	5,497	2.09	2,118
16.....	6.10	19,180	4.45	11,115	3.71	8,363	2.95	6,140	2.62	5,336	2.08	2,116
17.....	7.15	25,200	4.25	10,295	3.63	8,113	2.92	6,056	2.71	5,544	2.05	2,110
18.....	7.24	25,740	4.23	10,213	3.63	8,113	2.90	6,000	2.64	5,382	2.03	2,106
19.....	6.85	23,405	4.20	10,090	3.65	8,175	2.87	5,828	2.61	5,313	2.77	2,271
20.....	6.54	21,644	4.35	10,705	3.63	8,113	2.84	5,856	2.56	5,198	1.78	2,056
21.....	6.15	19,460	4.87	12,918	2.63	8,082	2.87	5,928	2.67	5,451	1.97	2,094
22.....	6.05	18,900	4.90	13,050	3.60	8,020	2.93	6,056	2.56	5,198	1.97	2,094
23.....	6.31	20,356	4.75	12,390	3.51	7,741	2.97	6,196	2.77	5,688	2.07	2,114
24.....	6.35	20,580	4.66	11,998	3.33	7,217	3.03	6,364	2.60	5,290	2.27	2,156
25.....	6.25	20,020	4.57	11,614	3.22	6,898	3.02	6,336	2.47	4,991	1.98	2,196
26.....	6.35	20,580	4.55	11,530	3.15	6,705	2.97	6,196	2.37	4,761	2.02	2,104
27.....	7.60	27,900	4.55	11,530	3.17	6,763	3.00	6,280	2.13	4,260	2.51	2,202
28.....	7.85	29,420	4.80	12,610	3.17	6,763	2.92	6,056	1.98	3,962	2.07	2,114
29.....	7.15	23,200	4.95	13,275	3.15	6,705	2.94	6,112	1.47	3,042	2.12	2,124
30.....	6.67	22,372	5.00	13,500	3.10	6,560	2.92	6,056	1.97	*3,000	2.52	2,204
31.....	6.30	20,300	5.15	14,250	.....	.....	2.90	6,000	.....	.....	2.37	*2,174

\* Ice conditions, discharges from measurements, and other data are at best an estimate.



## MONTHLY DISCHARGE of South Saskatchewan River at Medicine Hat, for 1911-12.

(Drainage area, 20,870 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
June.....	40,140	14,250	32,694	1.57	1.75	1,945,440
July.....	33,575	13,500	25,825	1.24	1.43	1,587,925
August (1-28).....	25,500	13,500	18,545	0.89	0.86	956,367
September ①.....						
October ①.....	7,790	4,360	4,225	0.20	0.22	251,552
November.....	4,562	790	2,501	0.12	0.14	153,781
December.....						
The period.....					4.40	4,895,095
1912						
January.....	2,166	1,016	1,663	0.08	0.09	102,253
February.....	2,504	1,776	2,134	0.10	0.11	122,748
March (1-24 and 27).....	2,940	1,550	1,792	0.09	0.08	88,858
April (10-19).....	7,772	6,252	6,746	0.32	0.12	133,805
May (3-31).....	20,020	6,056	12,587	0.62	0.66	741,259
June.....	39,815	9,905	19,121	0.92	1.02	1,137,760
July.....	30,715	18,080	21,513	1.03	1.19	1,322,793
August.....	18,620	10,090	13,292	0.64	0.73	817,304
September.....	13,050	6,560	8,698	0.42	0.46	517,576
October.....	6,364	5,760	6,065	0.29	0.34	372,945
November.....	5,904	3,000	5,099	0.24	0.27	303,429
December.....	3,040	2,056	2,376	0.11	0.13	146,096
The period.....					5.20	5,806,826

① No observations in September and October.

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in South Saskatchewan River Drainage Basin, in 1912.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
July 3...	R. H. Goodchild.	Big Spring Creek...	N.W. 28-20-8-3..	4.00			①1.85
July 3...	do	Big Spring Creek...	do				①0.02
Sept. 11...	do	Spring Creek.....	N.E. 27-19-15-3.				①0.40
Sept. 11...	do	Spring Creek.....	N.W. do				①0.11
Sept. 11...	do	Spring Creek.....	N.E. 26-19-15-3.				①0.32
Sept. 21...	do	Spring Creek.....	N.E. 27-23-27-3.				①0.76

①Weir Measurement.

NOTE.—Width is the actual width of water surface, not including piers. Area of section is the total area of the measured section, including both moving and still water.

## RED DEER RIVER DRAINAGE BASIN.

*General Description.*

Red Deer River rises in the Sawback Range of the Rockies in the northern portion of the Rocky Mountain Park, near the boundary between the Provinces of Alberta and British Columbia. It flows eastward for about 40 miles, then northeastward for 70 or 80 miles to a point near Red Deer, Alberta. From here the river flows in a southeasterly and easterly direction to its junction with the South Saskatchewan River, just east of the Fourth Meridian, in T<sub>p</sub>. 22, R<sub>ge</sub>. 28, W. 3<sup>rd</sup> Mer. It has a length of approximately 400 miles.

The valley of the Red Deer is wide and deep, the banks being very rough and cut up with a large number of deep coulees, draining in to the river. Near its source the basin is well timbered and a good growth of timber is found along its banks for some distance out into the prairie. Seams of coal, well suited for domestic use, are found in the valley and form the principal source of fuel supply for the settlers along the stream in the prairie section.

The river carries a considerable supply of water at all times of the year, but the volume is subject to sudden variations, due to the melting of snow in the mountains and to heavy summer rains.

Of the tributaries of the Red Deer, the most important are Panther River, near its head, Little Red Deer, entering in T<sub>p</sub>. 36, R<sub>ge</sub>. 1, W. 5<sup>th</sup> Mer., and Rosebud River, emptying into it in T<sub>p</sub>. 28, R<sub>ge</sub>. 19, W. 4<sup>th</sup> Mer. In addition, there are innumerable small streams draining into the main river in the western portion of the basin. From the mouth of the Rosebud River eastward there is very little drainage into the river.

Very little water is taken from the Red Deer and its branches for irrigation purposes. There are only a few small schemes on some of the smaller tributaries. The land along the valley, though lacking moisture, is extremely fertile, and with the help of irrigation much of it might be cultivated and fine crops produced. The irrigation of the bench land from the river would be difficult on account of the small fall in the river, the depth of the valley, and the rolling nature of the lands in the drainage basin.

Very little hydrographic work has been done in this basin as yet. A gauging station was established on the Red Deer River near Innisfail, in 1910, but an observer could not be secured and only periodic discharge measurements have been secured at this station. In the Fall of 1911, another gauging station was established at the town of Red Deer, and continuous records have been obtained since then.

Of the tributaries of Red Deer River, Berry and Blood Indian Creeks are the only ones that have been given any attention. These small creeks, which drain into the river in the prairie section, have a few small irrigation rights registered against them, and gauging stations were established on them in 1911.

## RED DEER RIVER AT RED DEER.

This station was established December 2, 1911, by J. E. Degnan. It is located at the traffic bridge in the town of Red Deer, on the S.E.  $\frac{1}{4}$  Sec. 20, T<sub>p</sub>. 38, R<sub>ge</sub>. 27, W. 4<sup>th</sup> Mer.

The gauge, which is of the standard chain type, is fixed to the floor of the bridge at a point about the middle of the north span, on the upstream side of the bridge. The length of the chain from the bottom of the weight to the marker is 29.52 feet. The zero of the gauge (elev. 84.40) is referred to two bench marks on the northwest face of the north abutment at assumed elevations 100.00 and 95.00.

The stream flows in one channel at all stages. This channel is straight for about 600 feet above and 1,300 feet below the gauge.

At very high stages the river may overflow the right bank, but not the left, as it is high and steep. The bed of the stream is composed of gravel, but it is firm and not liable to shift.

Discharge measurements are made from the downstream side of the bridge during the open season. The initial point for soundings is a point near the north end of the bridge and is marked on the handrail of the bridge.

Until June 10, 1912, the gauge was read by Leo. B. Brown, after which date Mr. C. H. Snell took over the work, and continued to read the gauge until December 31.

## DISCHARGE MEASUREMENTS of Red Deer River at Red Deer, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 10, 11.....	J. E. Degnan.....	232	220.3	1.38	4.06	311.7
Jan. 24.....	L. J. Gleeson.....	212	223	1.10	4.04	265.6
Feb. 15.....	do.....	212	223.7	1.29	4.20	302.7
Mar. 9.....	N. M. Sutherland.....	216	234	1.18	4.11	277
Mar. 22.....	H. J. Duffield.....	225	220.8	1.18	4.07	261
April 13.....	do.....	256.7	625.6	2.45	4.10	1,536
May 3.....	do.....	345.9	1,088.9	3.45	5.31	3,756
May 16.....	G. H. Whyte.....	346.5	1,126.7	3.44	5.48	3,871
June 11.....	do.....	253	769.9	2.82	4.345	2,170
June 29.....	do.....	329	1,053.7	3.46	5.245	3,645
July 27.....	do.....	356	2,005	5.41	7.77	10,839
Aug. 17.....	do.....	343	1,075	3.62	5.385	3,890
Sept. 4.....	do.....	348	1,136	3.611	5.64	4,103
Oct. 7.....	do.....	258	854.8	2.61	4.50	2,230
Nov. 14.....	do.....	255	678	2.32	3.955	1,576
Dec. 18.....	F. R. Burfield.....	280	681	0.62	5.04	441

## DAILY GAUGE-HEIGHT AND DISCHARGE of Red Deer River at Red Deer, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.94	222	4.06	248	4.44	327	5.76	1,950	4.13	1,705	4.36	2,066
2.....	4.00	235	4.08	252	4.41	321	4.98	1,910	4.95	3,070	4.32	2,002
3.....	4.02	239	4.07	250	4.33	304	4.76	2,050	5.34	3,796	4.36	2,066
4.....	4.07	250	4.08	252	4.30	298	4.68	2,100	5.62	4,376	4.28	1,938
5.....	4.11	258	4.10	256	4.25	288	4.55	2,210	6.16	5,702	4.06	1,600
6.....	4.13	262	4.11	258	4.19	275	4.54	2,358	6.63	7,040	4.01	1,525
7.....	4.14	264	4.10	256	4.15	266	4.60	2,460	6.53	6,740	3.99	1,495
8.....	4.14	264	4.10	256	4.14	264	4.70	2,630	6.63	7,040	3.96	1,450
9.....	4.10	256	4.10	256	4.10	256	4.45	2,210	6.50	6,650	4.18	1,780
10.....	4.07	250	4.11	258	4.08	252	4.74	2,698	6.02	5,332	4.47	2,242
11.....	4.05	246	4.14	264	4.07	250	4.30	1,970	5.52	4,154	4.32	2,002
12.....	4.03	241	4.14	264	4.05	246	4.19	1,795	5.17	3,473	4.22	1,842
13.....	4.00	235	4.15	266	4.05	246	4.10	1,660	5.04	3,232	4.27	1,922
14.....	3.95	225	4.16	268	4.05	246	4.16	1,750	5.03	3,214	4.64	2,528
15.....	3.94	222	4.16	268	4.06	248	4.24	1,874	5.34	3,796	4.80	2,800
16.....	3.97	229	4.19	275	4.06	248	4.39	2,114	5.50	4,110	7.48	9,832
17.....	3.98	231	4.20	277	4.05	246	4.52	2,324	5.48	4,070	8.51	13,532
18.....	4.01	237	4.24	285	4.08	252	4.59	2,443	5.19	3,511	7.65	10,425
19.....	4.03	241	4.27	292	4.05	246	4.39	2,114	5.00	3,160	6.92	7,944
20.....	4.01	237	4.29	296	4.06	248	4.32	2,002	5.02	3,196	6.44	6,476
21.....	4.00	235	4.28	294	4.07	250	4.20	1,810	5.14	3,416	6.07	5,462
22.....	3.99	233	4.28	294	4.07	250	4.05	1,585	5.13	3,397	5.81	4,824
23.....	3.99	233	4.25	288	4.09	400	3.99	1,495	5.22	3,568	5.70	4,560
24.....	4.00	235	4.30	298	4.16	510	3.98	1,480	5.09	3,322	5.57	4,264
25.....	4.01	237	4.29	296	4.66	780	4.02	1,540	4.91	2,998	5.46	4,030
26.....	4.03	241	4.26	290	5.51	1,050	4.01	1,525	4.90	2,980	5.36	3,834
27.....	4.03	241	4.29	296	5.64	1,230	4.00	1,510	5.06	3,268	5.25	3,682
28.....	4.04	243	4.28	294	5.87	1,425	3.95	1,435	5.35	3,515	5.28	3,682
29.....	4.04	243	4.37	313	.....	.....	3.85	1,290	4.96	3,088	5.20	3,530
30.....	4.05	246	.....	.....	.....	.....	3.88	1,332	4.80	2,800	5.06	3,268
31.....	4.06	248	.....	.....	.....	.....	.....	.....	4.65	2,545	.....	.....

Ice conditions Jan. 1 to Mar. 22 (inc.).

Shifting conditions Mar. 23rd, to April 5th (inc.).

① Gauge heights, Jan. 28-31 (inc.) not reported by observer.

② Gauge heights, Mar. 29-31 (inc.) not reported by observer.

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Red Deer River at Red Deer, for 1912.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.05	3,250	6.10	5,540	6.13	5,621	4.80	2,800	4.06	1,600	6.60	④782
2.....	5.04	3,232	5.93	5,112	5.90	5,040	4.74	2,698	4.12	1,690	6.50	761
3.....	5.42	3,950	5.88	4,992	5.71	4,584	4.68	2,596	4.14	1,720	6.42	741
4.....	5.76	4,704	5.86	4,944	5.62	4,376	4.62	2,491	4.17	1,765	6.61	784
5.....	5.90	5,040	6.02	5,332	5.63	4,390	4.60	2,460	4.02	1,540	6.53	767
6.....	6.78	7,498	5.95	5,160	5.86	4,944	4.57	2,409	4.00	1,510	6.58	778
7.....	8.02	11,743	5.96	5,184	6.02	5,332	4.52	2,324	3.98	1,480	6.71	805
8.....	8.54	13,641	5.75	4,680	6.16	5,702	5.61	4,353	3.92	1,390	6.67	797
9.....	10.02	19,043	5.59	4,308	7.09	8,506	4.82	2,836	3.96	1,450	7.01	867
10.....	9.54	17,291	5.50	4,110	7.16	8,744	4.98	3,124	3.97	1,465	6.53	767
11.....	8.40	13,130	5.47	4,050	6.71	7,281	5.06	3,268	3.95	1,435	6.06	668
12.....	8.62	13,933	5.48	4,070	6.29	6,653	5.10	3,340	3.83	1,262	5.72	596
13.....	8.40	13,130	5.44	3,990	5.98	5,232	5.10	3,340	3.79	1,206	5.59	569
14.....	8.80	14,590	5.32	3,758	5.78	4,752	5.08	3,304	3.94	1,420	5.79	611
15.....	8.60	13,860	5.18	3,492	5.58	4,486	5.02	3,196	3.96	1,450	5.67	586
16.....	8.22	12,473	5.10	3,340	5.42	3,950	4.94	3,052	3.76	1,164	5.32	512
17.....	7.88	11,238	5.30	3,720	5.32	3,758	4.86	2,908	3.77	1,178	5.10	466
18.....	7.54	10,040	6.62	7,010	5.21	3,549	4.85	2,890	3.92	1,390	4.96	434
19.....	7.22	8,948	6.47	6,563	5.14	3,416	4.86	2,908	3.94	1,420	5.14	474
20.....	7.08	8,472	6.23	5,891	5.06	3,268	4.88	2,944	4.01	1,525	5.26	504
21.....	7.38	9,492	5.96	5,184	4.99	3,142	4.89	2,962	3.88	1,332	5.14	474
22.....	7.40	9,560	5.76	4,704	4.97	3,106	4.74	2,698	3.86	1,304	4.96	437
23.....	7.43	9,662	5.59	4,308	5.09	3,322	4.68	2,596	3.84	1,276	5.14	474
24.....	7.39	9,526	5.56	4,242	5.22	3,568	4.69	2,613	3.74	1,136	5.18	483
25.....	8.03	11,780	5.84	4,896	5.26	3,644	4.55	2,375	3.74	1,136	5.12	470
26.....	8.24	12,546	6.45	6,505	5.22	3,568	4.48	2,258	3.56	884	4.98	441
27.....	7.86	11,166	6.17	5,729	5.13	3,397	4.42	2,162	3.31	560	5.02	449
28.....	7.28	9,152	6.04	5,384	5.04	3,232	4.38	2,098	③3.69	600	5.16	479
29.....	6.87	7,784	6.24	5,918	4.96	3,088	4.34	2,034	7.18	650	5.19	485
30.....	6.58	6,890	6.36	6,248	4.86	2,908	4.13	1,705	②6.75	750	5.24	495
31.....	6.29	6,053	6.32	6,136	.....	.....	4.05	1,585	.....	.....	5.17	481

④ Gauge heights Nov. 28-30 (inc.) due to ice jam and bear no relation to discharge.

③ Ice conditions Dec. 1 to 31.

## MONTHLY DISCHARGE of Red Deer River at Red Deer, for 1912.

(Drainage area, 3,862 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	264	222	238	0.06	0.07	14,635
February.....	313	248	274	0.071	0.077	15,764
March (1-28).....	1,425	246	401	0.104	0.108	22,270
April.....	2,698	1,290	1,919	0.497	0.554	114,190
May.....	7,040	1,705	3,954	1.024	1.18	243,124
June.....	13,532	1,450	3,953	1.024	1.142	235,220
July.....	19,043	3,232	10,091	2.61	3.009	620,448
August.....	7,010	3,340	4,985	1.268	1.461	306,515
September.....	8,744	2,908	4,532	1.174	1.31	269,670
October.....	4,353	1,585	2,721	0.705	0.813	167,311
November.....	1,765	560	1,290	0.334	0.373	76,760
December.....	867	434	545	0.141	0.163	33,511
The period.....	.....	.....	.....	.....	10.26	2,119,418

## BERRY CREEK AT FORSTER'S RANCH.

This station was established on May 30, 1911, by R. T. Sailman. It is located on the N.W.  $\frac{1}{4}$  Sec. 21, Tp. 23, Rg. 13, W. 4th Mer., about ten miles east of the village of Hutton.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post driven into the bed of the stream at the right bank. The zero (elev. 93.08) is referred to a permanent iron bench mark (assumed elev. 100.00) located 45 feet west and 30 feet south of the gauge.

The channel is straight for 100 feet above and 30 feet below the station. The right bank is low, covered with scrub and will overflow in high water; the left bank is high and sparsely covered with brush. The bed of the stream is soft and may shift at high stages. The current is sluggish.

Discharge measurements are made at a wading section some distance downstream from the gauge.

During 1912 the gauge was read twice daily by Miss L. Forster.

## DISCHARGE MEASUREMENTS of Berry Creek at Forster's Ranch, in 1912.

Date	Hydrographer.	Width. <i>Feet.</i>	Area of Section.	Mean Velocity.	Gauge Height. <i>Feet.</i>	Discharge. <i>Sec.-ft.</i>
			<i>Sq. ft.</i>	<i>Ft. per sec.</i>		
June 16.....	F. R. Burfield.....	16.8	9.86	1.44	2.19	14.16
Aug. 3.....	do .....	18.3	25.46	2.41	3.06	61.46
Aug. 29.....	do .....	15.8	8.58	0.89	2.01	7.64
Sept. 28.....	do .....	14.7	5.56	0.45	1.79	2.48
Oct. 25.....	do .....	15.0	5.23	0.47	1.80	2.44

These gaugings were made at a ford about half a mile below the gauge.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Berry Creek at Forster's Ranch, for 1912.

DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			3.21		2.36	22	3.26	74	1.98	6.8
2.....			2.82		2.36	22	3.32	78	1.99	7.1
3.....			3.39		2.28	18.0	3.34	79	1.88	6.8
4.....			3.26		2.21	15.0	3.34	79	1.99	7.1
5.....			3.12		2.16	12.9	3.26	74	1.97	6.5
6.....			3.28		2.16	12.9	3.18	69	1.95	5.9
7.....			3.42		2.15	12.5	3.08	63	1.94	5.6
8.....			3.48		2.12	11.4	2.96	55	1.93	5.4
9.....			3.68		2.11	11.1	2.74	42	1.92	5.1
10.....			3.62		2.09	10.4	2.56	32	1.91	4.9
11.....			3.31	77	2.06	9.3	2.46	26	1.91	4.9
12.....			3.14	66	2.04	8.8	2.41	24	1.91	4.9
13.....			3.04	60	1.98	6.8	2.36	22	1.90	4.6
14.....			3.02	59	1.92	5.1	2.31	19.3	1.90	4.6
15.....			2.94	54	1.91	4.9	2.16	12.9	1.90	4.6
16.....			2.86	49	1.90	4.6	2.20	14.6	1.96	6.2
17.....			2.81	46	1.90	4.6	2.18	13.8	3.22	71
18.....			2.75	42	1.89	4.4	2.16	12.9	3.01	58
19.....			2.71	40	1.89	4.4	2.15	12.5	2.80	46
20.....			2.67	38	1.86	3.6	2.12	11.4	2.76	43
21.....			2.62	35	1.85	3.4	2.09	10.4	2.71	40
22.....			2.59	33	1.85	3.4	2.04	8.8	2.69	39
23.....			2.56	32	1.84	3.2	1.98	6.8	2.65	37
24.....			2.52	30	1.85	3.4	1.96	6.2	2.64	36
25.....			2.44	25	1.85	3.4	1.95	5.9	2.65	37
26.....			2.37	22	1.87	3.9	1.93	5.4	2.65	37
27.....	3.14 ①		2.36	22	1.94	5.6	1.92	5.1	2.65	37
28.....	3.21		2.36	22	2.08	10.0	1.94	5.6	2.71	40
29.....	3.21		2.37	22	2.14	12.1	1.96	6.2	3.54	93
30.....	3.21		2.36	22	3.02	59	1.96	6.2	3.89	112
31.....	3.21				3.71	105			4.27	144

① Ice conditions March 27 to April 10, not sufficient data to compute the discharge during that period.

② Heavy rains at end of May and latter half of July.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Berry Creek at Forster's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.29	76	2.01	7.7	1.82	2.9	1.81	2.7
2.....	3.25	73	2.01	7.7	1.81	2.7	1.82	2.9
3.....	3.05	61	2.01	7.7	1.81	2.7	1.82	2.9
4.....	2.93	53	2.00	7.4	1.80	2.5	1.82	2.9
5.....	2.88	50	1.99	7.1	1.79	2.4	1.83	3.0
6.....	2.77	44	1.96	6.2	1.78	2.2	1.83	3.0
7.....	2.62	35	1.97	6.5	1.77	2.1	1.83	3.0
8.....	2.48	27	1.99	7.1	1.78	2.2	1.83	3.0
9.....	2.40	24	2.00	7.4	1.79	2.4	1.84	3.2
10.....	2.41	24	1.99	7.1	1.80	2.5	1.84	3.2
11.....	2.40	24	1.99	7.1	1.82	2.9	1.84	3.2
12.....	2.40	24	1.97	6.5	1.80	2.5	1.84	3.2
13.....	2.36	22	1.96	6.2	1.80	2.5	1.84	3.2
14.....	2.33	20	1.91	4.9	1.79	2.4	1.84	3.2
15.....	2.29	18.4	1.89	4.3	1.78	2.2	1.84	3.2
16.....	2.25	16.7	1.87	3.9	1.78	2.2	.....	.....
17.....	2.24	16.3	1.85	3.4	1.78	2.2	.....	.....
18.....	2.22	13.2	1.85	3.4	1.78	2.2	.....	.....
19.....	2.20	14.6	1.84	3.2	1.78	2.2	.....	.....
20.....	2.21	15.0	1.83	3.0	1.79	2.4	.....	.....
21.....	2.21	15.0	1.83	3.0	1.79	2.4	.....	.....
22.....	2.16	12.9	1.82	2.9	1.80	2.5	.....	.....
23.....	2.12	11.4	1.82	2.9	1.79	2.4	.....	.....
24.....	2.08	10.0	1.81	2.7	1.80	2.5	.....	.....
25.....	2.07	9.7	1.81	2.7	1.80	2.5	.....	.....
26.....	2.05	9.0	1.81	2.7	1.80	2.5	.....	.....
27.....	2.03	8.3	1.80	2.5	1.80	2.5	.....	.....
28.....	2.03	8.3	1.80	2.5	1.80	2.5	.....	.....
29.....	2.02	8.3	1.81	2.7	1.80	2.5	.....	.....
30.....	2.02	8.0	1.81	2.7	1.80	2.5	.....	.....
31.....	2.01	7.7	.....	.....	1.81	2.7	.....	.....

## MONTHLY DISCHARGE of Berry Creek at Forster's Ranch, for 1912.

(Drainage area, 991 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (11-30).....	77	22	39.8	0.0402	0.030	1,579
May.....	105	3.2	13.5	0.0136	0.016	830
June.....	79	5.1	29.4	0.0297	0.033	1,749
July.....	144	4.6	31.0	0.0313	0.036	1,908
August.....	76	7.7	24.5	0.0247	0.028	1,508
September.....	7.7	2.5	4.83	0.0049	0.005	287
October.....	2.9	2.2	2.45	0.0025	0.003	151
November (1-15).....	3.2	2.7	3.07	0.0031	0.002	91
The period.....	.....	.....	.....	.....	0.153	8,099

## BLOOD INDIAN CREEK AT HALLAM'S RANCH.

This station was established on June 26, 1911, by R. T. Sailman. It is located on the S.W.  $\frac{1}{4}$  Sec. 10, Tp. 23, Rge. 8, W. 4th Mer., about one and one-half miles above J. R. Hallam's house and 800 feet downstream from his irrigation dam.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to a post sunk in the bed of the stream at the left bank and securely stayed to the bank. The zero (elev. 91.00) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the left bank 55 feet east of the gauge.

The channel is straight for 20 feet above and 40 feet below the station. Both banks are high, fairly clear of brush and of clay formation. The bed of the stream is soft, with considerable vegetation and may shift at high stages. The current is sluggish.

Discharge measurements are made a short distance downstream from the station by wading, a weir being used at low stages of the stream.

During 1912, the gauge was read once daily by J. R. Hallam

As the station is situated below the storage reservoir, the rate of flow depends on the extent to which the sluice gates are open; it is consequently liable to sudden changes and long periods of uniform flow.

#### DISCHARGE MEASUREMENTS of Blood Indian Creek at Hallam's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 17.....	F. R. Burfield.....	7.5	2.53	1.52	2.25	3.84
Aug. 4.....	do.....	4.0	0.81	0.85	2.17	0.69
Aug. 30.....	do.....	5.2	0.91	0.61	2.16	0.56
Sept. 30.....	do.....	5.9	2.17	1.65	2.30	3.58
Oct. 25.....	do.....	9.4	4.48	0.26	2.25	1.17

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Blood Indian Creek at Hallam's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.60	①	2.20	2.4	4.08	②	2.26	3.7
2.....	3.65	.....	2.20	2.4	4.09	③	2.27	4.0
3.....	3.65	.....	2.20	2.4	4.00	③	2.27	3.9
4.....	3.65	.....	2.20	2.4	4.00	③	2.27	3.9
5.....	2.40	.....	2.20	2.4	3.20	③	2.27	3.8
6.....	2.35	.....	2.20	2.4	2.27	4.5	2.27	3.8
7.....	2.35	.....	2.20	2.4	2.27	4.5	2.27	3.7
8.....	2.60	①	2.20	2.4	2.27	4.5	2.27	3.7
9.....	2.45	10.0	2.20	2.4	2.27	4.5	2.27	3.7
10.....	2.45	10.0	2.20	2.4	2.27	4.5	2.25	3.0
11.....	2.45	10.0	2.20	2.4	2.27	4.5	2.24	2.7
12.....	2.30	5.4	2.20	2.4	2.26	4.2	2.24	2.7
13.....	2.30	5.4	2.20	2.4	2.26	4.2	2.24	2.6
14.....	2.35	7.0	2.20	2.4	2.26	4.2	2.23	2.4
15.....	2.35	7.0	2.18	1.92	2.26	4.2	2.23	2.3
16.....	2.30	5.4	2.18	1.92	2.26	4.2	2.23	2.3
17.....	2.32	6.0	2.18	1.92	2.25	① 3.8	2.20	1.56
18.....	2.32	6.0	2.18	1.92	2.25	3.8	2.20	1.53
19.....	2.32	6.0	2.18	1.92	2.25	3.8	2.20	1.52
20.....	2.34	6.7	2.18	1.92	2.25	3.7	2.20	1.50
21.....	2.34	6.7	2.08	0.45	2.25	3.7	2.19	1.28
22.....	4.95	②	2.08	0.45	2.25	3.7	2.19	1.27
23.....	5.00	.....	2.08	0.45	2.25	3.6	2.17	0.91
24.....	2.45	10.0	2.08	0.45	2.25	3.6	2.17	0.90
25.....	2.35	7.0	2.08	0.45	2.25	3.6	2.17	0.88
26.....	2.30	5.4	2.07	0.39	2.25	3.5	2.17	0.87
27.....	2.30	5.4	2.07	0.38	2.25	3.5	2.17	0.85
28.....	2.30	5.4	2.07	0.39	2.25	3.5	2.17	0.82
29.....	2.20	2.4	4.20	③	2.25	3.5	2.17	0.80
30.....	2.20	2.4	4.20	③	2.25	3.5	2.17	0.78
31.....	.....	.....	4.20	③	.....	.....	2.16	0.67

① Ice conditions to April 8. Insufficient data to compute discharges.

② Insufficient data to compute discharges.

③ Shifting conditions, June 17 to August 4.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Blood Indian Creek at Hallam's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.16	0.66	2.16	0.58	2.19	0.88	2.20	0.53
2.....	2.16	0.62	2.16	0.58	2.19	0.86	2.20	0.53
3.....	2.16	0.60	2.16	0.58	2.19	0.84	2.21	0.65
4.....	2.17	①0.69	2.16	0.58	2.19	0.82	2.21	0.65
5.....	2.14	0.44	2.16	0.58	2.17	0.57	2.21	0.65
6.....	2.14	0.44	2.16	0.58	2.17	0.56	2.21	0.65
7.....	2.14	0.43	2.16	0.58	2.17	0.54	2.21	0.65
8.....	2.14	0.43	2.16	0.58	2.17	0.53	2.21	0.65
9.....	2.14	0.43	2.16	0.58	2.17	0.52	2.21	0.65
10.....	2.14	0.43	2.16	0.58	2.17	0.51	2.21	0.65
11.....	2.14	0.43	2.16	0.58	2.17	0.50	2.21	0.65
12.....	2.14	0.43	2.16	0.58	2.17	0.49	2.21	0.65
13.....	2.14	0.43	2.18	0.80	2.17	0.48	2.21	0.65
14.....	2.14	0.43	2.18	0.80	2.17	0.46	2.21	0.65
15.....	2.14	0.43	2.18	0.80	2.17	0.45	2.21	0.65
16.....	2.14	0.43	2.18	0.80	2.17	0.44	.....	.....
17.....	2.14	0.43	2.17	0.69	2.17	0.43	.....	.....
18.....	2.14	0.43	2.17	0.69	2.17	0.42	.....	.....
19.....	2.14	0.43	2.17	0.69	2.17	0.40	.....	.....
20.....	2.14	0.43	2.17	0.69	2.17	0.39	.....	.....
21.....	2.14	0.43	2.17	0.69	2.17	0.38	.....	.....
22.....	2.14	0.43	2.17	0.69	2.17	0.37	.....	.....
23.....	2.14	0.43	2.17	0.69	2.17	0.36	.....	.....
24.....	2.14	0.43	2.17	0.69	2.17	0.35	.....	.....
25.....	2.14	0.43	2.17	0.69	2.25	①1.17	.....	.....
26.....	2.14	0.43	2.17	0.69	2.17	0.35	.....	.....
27.....	2.14	0.43	2.20	0.07	2.17	0.35	.....	.....
28.....	2.14	0.43	2.24	1.89	2.17	0.35	.....	.....
29.....	2.14	0.43	2.24	1.89	2.17	0.35	.....	.....
30.....	2.16	0.58	2.24	①1.89	2.17	0.35	.....	.....
31.....	2.16	0.58	.....	.....	2.17	0.35	.....	.....

① Shifting conditions June 17 to August 4.

② Shifting conditions Sept. 30 to Oct. 25.

## MONTHLY DISCHARGE of Blood Indian Creek at Hallam's Ranch, for 1912.

(Drainage area, 322 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (9-21 and 24-30).....	10.0	2.4	6.48	0.0201	0.0150	257
May (1-28).....	2.4	0.39	1.73	0.0054	0.0056	96
June (6-30).....	4.5	3.5	3.95	0.0123	0.0107	196
July.....	4.0	0.67	2.20	0.0068	0.0079	136
August.....	0.69	0.43	0.47	0.0014	0.0017	29
September.....	1.89	0.58	0.79	0.0025	0.0027	47
October.....	1.17	0.35	0.51	0.0016	0.0018	31
November (1-15).....	0.65	0.53	0.63	0.0020	0.0011	19
The period.....	.....	.....	.....	.....	0.0465	811

NOTE.—Owing to the fact that no high discharge measurements were obtained it was impossible to estimate discharges for high gauge heights in April, May and June.



MISCELLANEOUS DISCHARGE MEASUREMENTS made in Red Deer River Drainage Basin,  
in 1912.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per Sec.</i>	<i>Sec.-ft.</i>
Aug. 3...	F. R. Burfield...	Berry Creek, E. Br.	S.E. 28-23-11-4...				nil.
Sept. 28...	do	do	do				nil.
June 12...	G. H. Whyte...	Blindman River...	N.W. 15-39-27-4.	97	303.5	0.326	99.03
Sept. 7...	do	do	do	102	1160.3	0.866	398.4
Oct. 24...	F. R. Burfield...	Bullpound Creek...	N.E. 25-24-15-4.	3.2	0.64	0.41	0.26
Sept. 27...	do	Red Deer River...	N.W. 6-24-14-4.	435	1,706	2.58	11,399
Oct. 24...	do	do	do	441	1,514	2.46	5,718
Oct. 2...	P. J. Jennings...	Kennedy Creek...	S.E. 16-23-2-4.				0.332
Oct. 10...	J. W. Kennedy...	do	do				0.302
Oct. 17...	do	do	do				0.395
Nov. 11...	do	do	do				0.363
Nov. 22...	do	do	do				0.395
June 12...	G. H. Whyte...	Waskosoo Creek..	N.E. 16-36-28-4.	14.9	13.54	0.973	13.17

NOTE.—*Width* is the actual width of water surface, not including piers. *Area of section* is the total area of the measured section, including both moving and still water.

## BOW RIVER DRAINAGE BASIN.

### General Description.

Bow River heads in Lakes Bow and Hector, which are situated in the Rocky Mountain Park, north of the main line of the Canadian Pacific Railway and just east of the Great Divide, and whose elevations are 6,420 and 5,694 feet, respectively, above mean sea level. It flows in a south and easterly direction to the city of Calgary, where it takes a big bend to the south, and then continues in a south and easterly direction to its junction with Belly River at the Grand Forks. Below this point the united stream is known as the South Saskatchewan River.

Bow River has a large number of tributaries in the western portion of its course. Of these the principal are Cascade and Ghost rivers draining the northern portion of the basin, and Spray Kananaskis, Elbow, Sheep, and Highwood rivers draining the southern portion. Below the mouth of Highwood River very little drainage reaches Bow River, and in consequence it depends for its supply almost wholly upon the run-off from the mountains and foothills. As a result, Bow River possesses a normally steady flow throughout the year, but is subject to sudden freshets caused by melting snow and heavy rains in the mountains. The minimum flow occurs in the frozen season, when there is little run-off from the snow fields in the western part of the drainage basin.

The valley of the Bow is deep and well defined throughout its course. In the mountain section it is, naturally, comparatively narrow and very heavily timbered, whilst the bed is stony and the banks high and rocky. The nature of the valley changes gradually until, when it reaches the prairie, it is wide, of a clay formation, and devoid of trees, whilst the bed consists for the most part of gravel. The water is clear and pure.

A considerable quantity of water is being diverted from Bow river for irrigation purposes, and more will be used in the near future. The Natural Resources Department of the Canadian Pacific Railway Company is preparing to irrigate about 700,000 acres of land lying north of its main line between Calgary on the west and the eastern boundary of Range 11, West of the Fourth Meridian, on the east. The water is being diverted at two points, one about two miles east of Calgary and the other about three miles south west of Bassano. The western section of the tract is now supplied with water, and the works near Bassano, to supply the Eastern portions, are being rushed to completion.

The Southern Alberta Land Company have been granted water rights, and are constructing works to irrigate about 300,000 acres of land to the west of Medicine Hat. The headgates of their canal and their reservoir are near Gleichen. In addition to these large projects, there are a number of small schemes on Highwood and Sheep Rivers and their branches.

There are many favourable sites for power development on the Bow and its tributaries, but up to the present only one of any importance has been utilized. This is just below Kananaskis Falls, where the Calgary Power and Transmission Company have installed a plant to supply Calgary with electric light and power. At present only 12,000 horse power is being developed, but ultimately this will be raised to 30,000 horse power, the plant being designed to accommodate this increase.

In addition to these projects, the city of Calgary draws its domestic water supply from the Elbow River. The intake is about twelve miles southwest of Calgary, above which point the

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course of the river is through a wild and unsettled country, where there is no possibility of human contamination.

During 1912, there were no floods in the main portion of Bow River Basin, though in the extreme south west, owing to an exceptional rainfall in the mountains, Highwood River overflowed its banks on June 15 and 16, and did considerable damage.

The brushwood dam at the head of Little Bow ditch was breached in several places; it was replaced in the fall with a new timber sheet-piling one by the Provincial Government. The Canadian Pacific Railway Company's grade was washed out in several places between High River and Tonguefall Creek. The Canada Western Natural Gas Company also suffered considerable loss on their new pipe line between Lethbridge and Calgary, and one man was drowned at a camp near High River. Logs belonging to the Lineham Lumber Company were stranded all along the banks of Highwood River.

Sheep River washed out its left bank in the town of Okotoks, and protection works will probably be needed to prevent further encroachments.

Bow River itself, above its confluence with Highwood River, reached its highest level in July, but no damage by flood was reported.

## FLOOD DISCHARGE OF BOW RIVER.

The most destructive flood ever witnessed in the Bow River valley since its settlement occurred about the middle of June, 1897. It was brought about by a cloudburst near Castle Mountain, near Canmore, following an abnormal rainfall in the early part of June.

It is stated that the greatest flood occurred in 1879, but no data regarding this flood is available.

Another flood occurred in 1884, but inhabitants who witnessed both floods agree that the water was a foot higher in 1897 than in 1884.

Another flood which almost equalled that of 1897 in magnitude and destructiveness occurred in the early part of July, 1902.

Though the hydrographic records of this office date back to 1894, no systematic and continuous record of the stages and discharge of Bow River was kept until 1908. These records extend, with the exception of the winter months during the first two years, to date, but the only flood of any account during this period occurred in July, 1909. The maximum discharge at the bridge on the Calgary and Edmonton Branch of the Canadian Pacific Railway, in 1909, was about 23,000 sec. ft. on July 7th.

It is very hard to estimate the loss, but in running over the damage to gardens, fences, trees, houses, lots, streets, sidewalks, destruction of bridges, railway tracks, etc., the statement is ventured that the loss caused by the flood in 1897 totalled nearly a quarter million dollars in the vicinity of Calgary alone.

The rainfall for the 14th, 15th, 16th and 17th June, 1897, totalled 2.94, or practically three inches in three days and a half. During the night of the 17th the river which was already swollen rose very rapidly, and before midnight overflowed its banks and flooded several houses on the flats south and west of the Langevin bridge. The city fire brigade and the North West Mounted Police turned out with teams and waggons, which were kept going nearly all night moving women, children and furniture from the flooded districts. In all, about sixty families were driven out of their homes.

The Eau Claire power plant was flooded and the dam, which still exists, was in grave danger. One span of the Bow Marsh Bridge, which was just above the present Louise Bridge in the West and of Calgary, was carried away and floating down the river intact struck a pier of the old Langevin Bridge and broke up. Several houses and the Calgary Hydraulic Company's flume were also carried away by the flood. The middle pier of the old Langevin Bridge sank but the bridge was not carried out, though it could not be reached at all from the south side.

The Calgary and Edmonton Bridge was not seriously damaged, but the water broke through the grade on the south bank and carried away a part of it.

A fine residence on the south bank of the river, about two miles below the city and belonging to Colonel Walker was dropped into the river by the banks caving in, and was carried to destruction, the water having cut into the bank for fifty feet or more.

The bridge over the river on the main line of the Canadian Pacific Railway east of Calgary was not damaged and the water did not break through the grade. The railway, however, suffered very heavy losses at several places west of Calgary. At Shaginappi Point the track was washed out and a long stretch of it had to be re-located. From Calgary to Canmore the track and bridges were damaged and carried out at several places. The mines at Anthracite were wholly submerged.

Fish Creek was also very high and at the mouth of this stream Bow River was reported to be twelve to fourteen feet above low water mark.

Highwood and Sheep rivers were also very high and did a great deal of damage. The trails were in a fearful condition and the whole country seemed to be covered with water.

A bountiful rainfall during the latter part of June, 1902, and an abnormal downpour during the first few days of July resulted in a second very destructive flood. During the night of July 4th, the river overflowed the flats to the south and west of the Langevin Bridge in Calgary, and again the city fire brigade and North West Mounted Police came to the rescue of the unfortunate inhabi-

tants with waggons and teams. Many barely escaped with their lives. The bridge was again cut off from the south by the flood and several buildings were damaged, but while the water was higher at this point than in 1897, the actual damage to property was not as great. Colonel Walker's barn had to be moved to save it from being carried away. A man named Wilson living on an island near the old Industrial School below the city had a narrow escape. He was rescued from the roof of his barn, which just showed above the water.

The Canadian Pacific Railway again suffered much loss by grades and bridges being damaged and washed out. The water again broke through the grade south of the Calgary and Edmonton Bridge, but the opening under the bridge on the main line east of the city again carried the floods. The Bow Marsh Bridge was in grave danger but was saved by being lashed to its supports.

The rainfall in Calgary for the month of May, 1902, was 8.90 inches, and in June 9.82 inches, while on July 4th and 5th 1.78 inches fell in 24 hours. The whole country was flooded and the Elbow and all tributaries of the Bow were exceedingly high.

The records of this office indicate that at the Langevin bridge the greatest height of the river in the 1902 flood was a couple of feet higher than in 1897, while the records of the C.P.R. Division Engineer show that at the bridge on the main line east of Calgary it was several inches lower.

Among the records of the office is an estimate of the maximum discharge at Langevin bridge during the 1897 flood of 54,000 second feet. It is very difficult at this date with the data available to compute the discharge, but this estimate was made shortly after the flood and by experienced and intelligent engineers and is, no doubt, fairly accurate.

The maximum flood discharge of Bow River at the C. & E. Bridge in 1897 would be 60,000 sec.-ft. The maximum discharge in 1902 did not quite reach this amount.

History goes to show that Bow River is subject to very big floods and in designing works such as dams and bridges a small amount at least should be added to the greatest known discharge. Between the mouth of Kananaskis River and Ghost River 40,000 sec. ft. should be allowed, between the mouth of Ghost River and Jumpingpound Creek, 50,000 sec. ft.; between the mouth of Jumpingpound Creek and Elbow River, 60,000 sec. ft.; between the mouth of Elbow River and Fish Creek, 70,000 sec. ft.; between the mouth of Fish Creek and Highwood River, 75,000 sec. ft.; and below Highwood River, 100,000 sec. ft. This discharge averages 19 cu. ft. per sec. per sq. mile for the drainage area above Calgary, about 18 cu. ft. per sec. per sq. mile for the drainage area above the mouth of Fish Creek, and about 16 cu. ft. per sec. per sq. mile for the drainage area at the mouth of Highwood River. A run-off of 19 cu. ft. per sec. per sq. mile equals a depth of seven-tenths of an inch in 24 hours.

#### BOW RIVER AT LAGGAN.

This station was established on July 18, 1910, by J. C. Keith. It was at first located at an old traffic bridge on the N.E.  $\frac{1}{4}$  Sec. 8, Tp. 28, Rge. 16, W. 5th Mer., about one third of a mile west of Laggan. This site did not prove satisfactory and a cable station was therefore established by H. C. Ritchie near the east boundary of the S.E.  $\frac{1}{4}$  Sec. 28, Tp. 28, Rge. 16, W. 5th Mer., on August 30, 1911. The new station is about half-a-mile southeast of Laggan and about 300 feet above the mouth of Pipestone River.

The gauge, which is of the standard chain type, is situated at the left bank, about eight feet downstream from the cable. The zero (elev. 89.14) is referred to a permanent iron bench mark (assumed elev. 100.00), situated about eleven feet southeast of the cable tower on the left bank.

The river flows in one channel at all stages. It is straight for 75 feet above and 200 feet below the station. Both banks are high and not liable to overflow. The right bank is covered with a good growth of spruce but the left is almost clear. The bed of the stream is composed of gravel and boulders but is not liable to shift. The current has a good velocity.

Discharge measurements are made by means of a cable car, tagged wire and stay wire. The initial point for soundings is the centre of the tower on the left bank, and distances are marked on the measuring wire by tags at every five feet.

During 1912, the gauge was read by E. Braund.

## SESSIONAL PAPER No. 25d

## DISCHARGE MEASUREMENTS of Bow River at Laggan, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 23.....	V. A. Newball.....	10.00	15.35	2.18	.....	33.43
Feb. 5.....	do.....	11.00	14.90	1.78	4.76	26.56
Feb. 16.....	do.....	39.60	60.87	2.33	.....	141.73
Feb. 28.....	do.....	16.00	36.60	2.00	7.47	73.06
Mar. 8.....	H. C. Ritchie.....	15.00	28.80	1.66	5.30	48.60
Mar. 18.....	do.....	15.00	22.80	1.50	4.73	37.50
Mar. 28.....	do.....	14.00	22.60	1.95	4.78	40.50
April 9.....	do.....	40.00	31.00	1.28	4.38	39.66
April 24.....	do.....	45.00	44.00	1.63	4.64	71.93
May 9.....	do.....	51.00	75.90	2.36	5.41	178.90
May 22.....	do.....	65.00	118.75	3.05	6.05	362.17
June 5.....	do.....	59.00	79.80	2.70	5.45	215.46
June 19.....	do.....	72.00	216.35	5.25	7.59	1,136.12
July 4.....	do.....	71.00	196.95	5.01	7.07	985.13
July 18.....	do.....	71.00	176.40	4.79	6.88	844.29
Aug. 1.....	do.....	72.00	210.15	5.30	7.30	113.72
Aug. 13.....	do.....	70.00	190.15	4.66	6.87	885.16
Aug. 29.....	do.....	72.50	227.40	4.86	7.34	1,104.40
Sept. 12.....	do.....	65.00	125.70	3.21	6.08	404.00
Oct. 4.....	H. R. Cram.....	58.00	84.90	2.48	5.40	210.50
Oct. 17.....	H. C. Ritchie.....	52.50	83.50	2.54	5.30	212.70
Nov. 1.....	do.....	46.00	53.40	1.58	4.68	84.69
Nov. 14.....	do.....	46.50	66.50	1.76	4.95	117.20
Nov. 28.....	do.....	45.00	71.25	1.11	5.03	79.20

## DAILY GAUGE-HEIGHT AND DISCHARGE of Bow River at Laggan, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	①	.....	5.54	46.76	6.46	59.64	4.75	35.70	4.65	71.00	5.81	313.35
2.....	.....	.....	5.37	44.38	6.43	59.22	4.72	35.28	4.62	67.40	5.74	292.35
3.....	.....	.....	5.34	43.96	6.25	56.70	4.68	34.72	4.73	81.70	5.61	255.95
4.....	.....	.....	5.14	41.16	6.22	56.28	4.66	34.44	4.75	84.50	5.55	240.25
5.....	.....	.....	4.76	35.84	5.98	52.92	4.72	35.25	4.85	100.00	5.45	215.75
6.....	.....	.....	4.94	38.36	5.80	50.41	4.68	③34.72	4.86	101.65	5.45	215.75
7.....	.....	.....	4.86	37.24	5.53	46.62	4.60	65.00	5.17	156.65	5.60	253.25
8.....	.....	.....	4.84	36.96	5.43	45.22	4.50	54.50	5.26	174.55	6.14	427.25
9.....	.....	.....	4.84	36.96	5.24	42.56	4.38	42.40	5.41	206.55	6.59	665.75
10.....	.....	.....	4.84	36.96	4.96	38.64	4.40	44.00	5.31	184.85	6.65	702.25
11.....	.....	.....	4.86	37.24	5.11	40.74	4.44	47.20	5.26	174.55	6.76	770.20
12.....	.....	.....	4.86	37.24	4.94	38.36	4.44	47.20	5.35	193.25	6.98	906.60
13.....	.....	.....	4.94	38.36	4.94	38.36	4.44	47.20	5.52	232.75	7.50	1229.00
14.....	.....	.....	5.33	43.82	4.92	38.08	4.45	48.00	5.85	325.75	7.16	1018.20
15.....	.....	.....	9.56	101.00	4.92	38.08	4.46	48.90	6.22	475.75	7.51	1235.20
16.....	.....	.....	9.95	107.00	4.90	37.80	4.50	54.50	6.45	582.25	7.20	1043.00
17.....	.....	.....	9.99	107.50	4.75	35.70	4.55	59.50	6.25	475.75	7.29	1068.80
18.....	.....	.....	9.95	107.00	4.74	35.56	4.57	61.70	6.24	471.15	7.41	1173.20
19.....	.....	.....	9.50	100.50	4.86	37.24	4.59	63.90	6.09	407.55	7.59	1284.80
20.....	.....	.....	8.72	90.00	5.02	39.48	4.58	62.80	6.05	392.75	7.71	1359.20
21.....	.....	.....	8.55	87.00	5.05	39.90	4.51	55.50	5.85	325.75	7.86	1452.20
22.....	.....	.....	8.76	91.00	4.92	38.08	4.58	62.80	6.06	396.45	7.87	1458.40
23.....	.....	.....	8.47	86.00	4.78	36.12	4.61	66.20	5.96	361.65	8.10	1601.00
24.....	.....	.....	7.39	72.00	4.76	35.84	4.65	71.00	6.06	396.45	8.18	1650.60
25.....	5.74	②49.56	7.60	74.00	4.78	36.12	4.71	78.90	6.20	452.75	8.20	1663.00
26.....	5.74	49.56	6.40	58.80	4.80	36.40	4.64	69.80	6.45	582.25	8.39	1780.80
27.....	5.73	49.42	6.35	58.10	4.88	37.52	4.65	71.00	6.65	702.25	8.51	1855.20
28.....	5.73	49.42	7.42	72.10	4.80	36.40	4.63	68.60	6.50	611.25	8.15	1632.00
29.....	5.73	49.42	6.26	56.84	4.78	36.12	4.64	69.80	6.28	490.45	7.70	1353.00
30.....	5.73	49.42	.....	.....	4.78	36.12	4.74	83.10	6.14	427.25	1.60	1291.00
31.....	5.64	48.16	.....	.....	4.73	35.42	.....	.....	5.96	361.65	.....	.....

① Ice jams rendered gauge heights useless Jan. 1 to 24.

② Ice conditions Jan. 25 to Apr. 6.

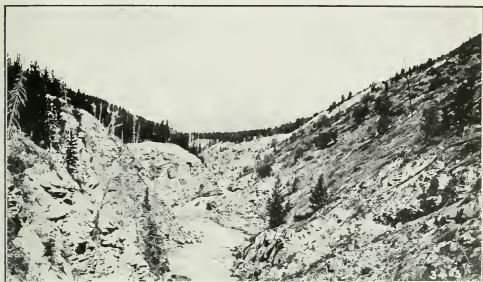
## DAILY GAUGE-HEIGHT AND DISCHARGE of Bow River at Laggan, for 1912—Concluded.

DAY.	July.		August.		September.		October.		November.		December	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	7.33	1123.6	7.27	1086.4	6.59	665.8	5.31	184.8	4.75	84.5	5.96	76.0
2.....	7.30	1105.0	7.35	1136.0	6.49	606.4	5.28	178.6	4.81	93.6	6.17	76.0
3.....	7.19	1036.8	7.35	1136.0	6.44	576.6	5.37	197.6	4.86	101.6	6.46	76.0
4.....	7.08	968.6	7.57	1272.4	6.30	500.2	5.37	197.6	4.89	106.6	6.60	75.0
5.....	7.08	968.6	7.65	1322.0	6.25	475.8	5.34	191.2	4.94	115.0	6.98	75.0
6.....	7.44	1191.8	7.31	1111.2	6.15	431.2	5.29	180.7	4.94	115.0	7.25	74.0
7.....	7.31	1111.2	7.13	999.6	6.10	411.2	5.25	172.5	4.95	116.8	7.28	74.0
8.....	7.18	1030.6	7.10	981.0	6.09	407.6	5.25	172.5	4.98	121.5	7.16	74.0
9.....	7.15	1012.0	7.35	1136.0	6.00	375.2	5.18	158.6	4.98	121.5	6.99	74.0
10.....	7.16	1018.2	7.31	1111.2	5.98	368.4	5.16	154.7	5.12	147.0	6.74	75.0
11.....	7.20	1043.0	7.25	1074.0	5.98	368.4	5.14	150.8	5.01	126.8	6.64	76.0
12.....	7.15	1012.0	7.03	937.6	6.08	403.8	5.06	135.8	4.99	123.8	6.76	75.0
13.....	7.33	1123.6	6.85	826.0	6.09	407.8	5.06	135.8	4.96	118.5	6.65	76.0
14.....	7.00	919.0	6.78	782.6	6.02	382.2	5.06	135.8	4.95	116.8	6.35	76.0
15.....	6.95	888.0	6.84	819.8	5.94	354.9	5.04	132.2	4.74	83.1	6.27	76.0
16.....	6.88	844.6	7.24	1067.8	5.89	338.6	5.11	145.2	4.90	102.0	6.27	76.0
17.....	6.84	819.8	7.48	1216.6	5.87	332.2	5.28	178.6	4.96	107.0	6.27	76.0
18.....	6.86	832.2	7.26	1080.2	5.85	325.8	5.21	164.5	4.90	96.0	6.12	76.0
19.....	6.99	912.8	7.24	1067.8	5.78	304.2	5.16	154.7	4.75	78.0	6.09	76.0
20.....	7.06	956.2	7.24	1067.8	5.69	278.0	5.12	147.0	4.72	75.0	6.05	76.0
21.....	7.14	1005.8	7.30	1105.0	5.63	261.4	5.09	141.4	4.74	73.0	6.13	76.0
22.....	7.16	1018.2	7.48	1216.6	5.58	248.0	5.00	125.0	4.74	70.0	6.22	76.0
23.....	7.15	1012.0	7.65	1322.0	5.57	245.4	4.97	120.2	4.79	68.0	6.16	76.0
24.....	7.44	1191.8	8.44	1811.8	5.51	230.2	4.99	123.8	4.74	67.0	6.06	76.0
25.....	7.36	1142.2	8.56	1886.2	5.54	237.8	4.96	118.5	4.76	61.0	5.84	76.0
26.....	7.25	1074.0	8.09	1594.8	5.46	218.2	4.95	116.8	4.53	62.0	6.06	76.0
27.....	7.09	974.8	7.74	1377.8	5.44	213.4	4.95	116.8	4.76	68.0	6.00	76.0
28.....	6.94	881.8	7.56	1266.2	5.40	204.2	4.90	108.2	5.03	79.0	5.90	76.0
29.....	6.93	875.6	7.28	1092.6	5.30	182.8	4.76	86.0	5.33	78.0	5.80	76.0
30.....	7.04	943.8	6.97	900.4	5.31	184.8	4.69	76.2	5.59	77.0	5.90	76.0
31.....	7.19	1036.8	6.75	764.0	.....	.....	4.70	77.5	.....	.....	5.86	76.0

## MONTHLY DISCHARGE of Bow River at Laggan, for 1912.

(Drainage area, 166 square miles.)

MONTH	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	49.56	48.16	49.28	0.30	0.08	684
February.....	107.50	35.84	62.90	0.38	0.41	3,618
March.....	59.64	35.42	41.67	0.25	0.29	2,562
April.....	83.10	34.44	55.12	0.33	0.37	3,280
May.....	702.25	67.40	324.79	1.96	2.26	19,970
June.....	1,855.20	215.75	1,014.58	6.11	6.83	60,385
July.....	1,191.80	819.80	1,002.40	6.04	6.96	61,634
August.....	1,886.20	764.00	1,147.40	6.91	7.97	70,551
September.....	665.8	182.8	351.34	2.11	2.35	20,906
October.....	197.6	76.2	144.59	.87	1.00	8,885
November.....	147.0	61.0	95.10	.57	.63	5,659
December.....	76.0	74.0	88.12	.53	.61	5,418
The year.....					29.76	263,552

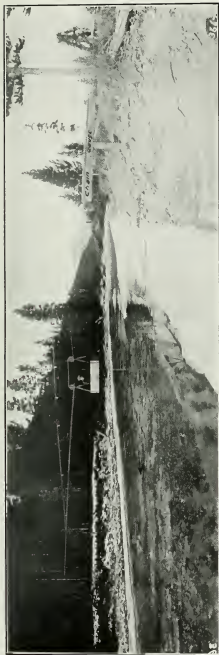


Falls on Pipestone River near Laggan, Alberta. Taken by P. M. Sauder.



Kananaskis Falls on Bow River at the mouth of Kananaskis River. Taken by P. M. Sauder.





Gauging Station on Bow River near Laggan in early fall. Taken by V. A. Newhall. PLATE No. 20



Gauging Station on Bow River near Laggan in winter. Taken by V. A. Newhall. PLATE No. 21





## PIPESTONE RIVER NEAR LAGGAN.

This station was established August 31, 1911, by H. C. Ritchie. It is located on the S.W.  $\frac{1}{4}$  Sec. 27, Tp. 28, Rge. 16, W. 5th Mer., about seven-eighths of a mile east of Laggan station and about 350 yards below the Canadian Pacific Railway bridge spanning the stream.

The gauge, which is of the standard chain type, is supported over the water by two posts set upright in the left bank of the stream, twelve feet south, or downstream, from the cable. The zero (elev. 91.54) is referred to a bench mark (assumed elev. 100.00) on an iron spike driven into the side of a spruce tree on the left bank, 22 feet north of the cable.

The channel is straight for 60 feet above and 100 feet below the station. Both banks are low, but are not liable to overflow. They are covered with low scrub and a sparse growth of spruce. The bed is rocky but fairly smooth at the cross-section. The fall of the stream is considerable and the current is swift.

Discharge measurements are made by means of a cable car, tagged wire and stay wire. The initial point for soundings is a point, suitably marked, on the centre of the left tower, supporting the cable, and distances are marked at every five feet.

During 1912, the gauge was read by E. Braund.

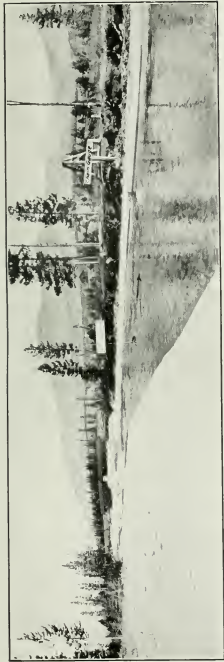
## DISCHARGE MEASUREMENTS of Pipestone River, near Laggan, in 1912.

Date	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 23.....	V. A. Newhall.....	17.0	13.0	2.42	4.67	31.43
Feb. 5.....	do.....	24.0	28.6	1.17	4.25	33.37
Feb. 15.....	do.....	35.0	32.5	0.75	4.975	24.5
Feb. 28.....	do.....	35.0	26.5	0.68	4.40	17.91
Mar. 8.....	H. C. Ritchie.....	33.0	17.1	1.00	4.20	17.06
Mar. 19.....	do.....	33.0	9.8	1.26	4.16	12.41
Mar. 29.....	do.....	33.0	25.7	1.03	4.00	26.52
April 10.....	do.....	35.0	26.0	0.846	3.85	22.02
April 24.....	do.....	40.0	36.1	1.01	4.12	36.59
May 10.....	do.....	59.0	70.3	2.34	4.69	164.76
May 22.....	do.....	73.0	98.9	3.21	5.20	317.67
June 5.....	do.....	59.0	65.1	2.33	4.65	151.5
June 19.....	do.....	75.0	132.5	5.12	5.85	780.21
July 4.....	do.....	74.0	106.9	3.65	5.29	389.65
July 18.....	do.....	73.0	107.30	3.71	5.29	398.07
Aug. 1.....	do.....	74.0	120.30	3.93	5.42	472.81
Aug. 13.....	do.....	68.0	94.25	3.36	5.12	316.34
Aug. 29.....	do.....	74.0	126.80	4.21	5.50	533.30
Sept. 12.....	do.....	65.0	91.00	3.14	5.08	286.00
Oct. 4.....	H. R. Cram.....	60.5	68.20	2.38	4.68	182.00
Oct. 17.....	H. C. Ritchie.....	58.5	66.80	2.43	4.57	162.10
Nov. 1.....	do.....	53.5	47.50	1.24	4.26	58.90
Nov. 14.....	do.....	58.0	58.10	1.32	4.60	76.50
Nov. 28.....	do.....			Ice jammed.		
Dec. 14.....	do.....	52.0	52.05	0.89	5.47	46.52

## DAILY GAUGE-HEIGHT AND DISCHARGE of Pipestone River near Laggan, for 1912.

DAY.	January.		February.		March.		April		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....		①	4.17	34.6	4.11	13.2	3.95	11.0	4.06	32.0	4.75	180.0
2.....			4.20	34.0	4.16	14.0	3.92	10.4	4.04	30.2	4.80	196.0
3.....			4.17	34.6	4.15	14.0	3.88	10.0	4.12	38.4	4.70	165.0
4.....			4.17	34.6	4.17	14.0	3.85	10.0	4.06	32.0	4.70	165.0
5.....			4.20	34.0	4.17	14.0	3.84	19.8	4.09	35.0	4.60	136.0
6.....			4.18	34.4	4.15	14.0	3.76	18.2	4.14	40.8	4.66	153.0
7.....			4.15	35.0	4.17	14.0	3.88	20.6	4.41	89.2	4.98	260.0
8.....			4.12	35.0	4.20	14.0	3.86	20.2	4.65	150.0	5.36	441.0
9.....			4.15	35.0	4.20	14.0	3.85	20.0	4.80	196.0	5.51	535.0
10.....			4.10	35.0	4.23	14.6	3.87	20.4	4.69	162.0	5.47	509.0
11.....			4.15	35.0	4.25	15.0	3.92	22.2	4.65	150.0	5.50	528.0
12.....			4.20	34.0	4.22	14.4	3.90	21.0	4.85	212.0	5.58	553.0
13.....			4.20	34.0	4.20	14.0	3.95	24.0	4.99	264.0	5.54	555.0
14.....			4.22	33.6	4.20	14.0	3.86	20.2	5.26	385.0	5.50	528.0
15.....			4.98	24.6	4.20	14.0	3.91	21.6	5.53	548.0	5.86	758.0
16.....			4.98	24.6	4.20	14.0	3.90	21.0	5.53	548.0	5.67	646.0
17.....			4.80	22.0	4.17	14.0	3.85	20.0	5.36	441.0	5.70	668.0
18.....			4.60	20.0	4.15	14.0	3.95	24.0	5.18	344.0	5.71	675.0
19.....			4.70	21.0	4.15	14.0	3.96	24.6	5.14	326.0	5.79	735.0
20.....			4.38	16.6	4.14	13.8	3.95	24.0	5.10	308.0	5.79	735.0
21.....			4.60	20.0	4.15	14.0	3.95	24.0	5.00	268.0	5.85	780.0
22.....			4.80	22.0	3.65	7.0	4.05	31.0	5.20	354.0	5.78	727.0
23.....			4.60	20.0	4.15	14.0	4.03	29.4	5.04	284.0	5.95	860.0
24.....	4.63	28.4	4.55	19.0	3.92	10.4	4.06	32.0	5.15	330.0	5.91	828.0
25.....	4.54	30.0	4.28	15.6	4.44	17.8	4.06	32.0	5.24	374.0	5.86	758.0
26.....	4.60	29.0	4.15	14.0	4.45	18.0	4.04	30.2	5.43	484.0	6.00	900.0
27.....	4.48	30.4	4.10	13.0	4.46	18.0	4.04	30.2	5.54	555.0	6.10	980.0
28.....	4.38	31.4	4.20	14.0	4.46	18.0	4.05	31.0	5.34	429.0	5.75	705.0
29.....	4.33	32.0	4.08	12.6	4.00	12.0	4.03	29.4	5.09	304.0	5.46	502.0
30.....	4.27	32.6			3.97	11.4	4.12	38.4	5.00	268.0	5.42	477.0
31.....	4.17	34.6			3.92	10.4			4.88	223.0		

① No records Jan. 1 to 23.



Gauging Station on Pipestone River near Laggan in early fall. Taken by V. A. Newhall.

PLATE No. 22



Gauging Station on Pipestone River near Laggan in winter. Taken by V. A. Newhall.

PLATE No. 23



## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Pipestone River near Laggan, for 1912.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.30	407	5.38	453	5.22	364	4.64	147	4.26	59	6.14	410
2.....	5.35	435	5.42	471	5.14	326	4.60	136	4.31	64	6.11	380
3.....	5.31	413	5.37	447	5.13	321	4.55	123	4.46	92	6.01	310
4.....	5.25	379	5.50	528	5.09	304	4.55	123	4.55	108	5.91	262
5.....	5.30	407	5.57	576	5.14	326	4.61	139	4.58	110	5.80	210
6.....	5.71	675	5.35	435	5.04	284	4.60	136	4.56	102	5.85	212
7.....	5.59	590	5.23	369	5.00	268	4.57	128	4.56	98	5.84	197
8.....	5.56	569	5.23	369	5.02	276	4.58	131	4.58	98	5.68	140
9.....	5.54	555	5.36	441	4.96	252	4.55	123	4.58	94	5.60	108
10.....	5.54	555	5.30	407	4.94	244	4.55	123	4.66	106	5.53	88
11.....	5.52	542	5.26	385	4.97	256	4.50	110	4.66	102	5.35	48
12.....	5.46	502	5.13	321	5.04	284	4.41	89	4.65	98	5.46	58
13.....	5.58	583	5.06	292	5.01	272	4.48	105	4.61	82	5.55	66
14.....	5.40	465	5.05	288	5.01	272	4.48	105	4.58	76	5.45	46
15.....	5.34	429	5.07	296	4.87	219	4.48	105	4.35	32	5.30	36
16.....	5.32	418	5.39	459	4.84	209	4.52	115	5.21	227	5.30	36
17.....	5.25	379	5.59	590	4.83	206	4.57	128	4.72	80	5.30	36
18.....	5.25	379	5.48	515	4.83	206	4.54	120	4.85	100	5.14	28
19.....	5.27	390	5.54	555	4.78	190	4.50	110	4.68	58	5.12	28
20.....	5.34	429	5.58	583	4.71	168	4.48	105	4.63	46	5.04	25
21.....	5.31	413	5.61	604	4.64	147	4.41	89	4.66	44	4.98	24
22.....	5.35	435	5.59	590	4.72	171	4.40	87	4.65	40	5.05	26
23.....	5.35	435	5.64	625	4.71	168	4.38	83	4.74	46	5.05	26
24.....	5.65	632	6.17	1,036	4.63	144	4.44	96	4.75	44	5.00	24
25.....	5.51	535	6.15	1,020	4.69	162	4.41	89	5.33	168	4.89	23
26.....	5.45	496	5.77	720	4.64	147	4.41	89	5.72	292	4.95	24
27.....	5.36	441	5.60	597	4.64	147	4.20	49	6.05	440	4.91	23
28.....	5.28	396	5.53	548	4.61	139	4.14	41	6.21	520	4.87	23
29.....	5.28	396	5.45	496	4.59	133	4.10	36	6.17	478	4.86	22
30.....	5.30	407	5.34	429	4.59	133	4.06	32	6.15	440	4.89	23
31.....	5.33	424	5.26	385	.....	.....	4.06	32	.....	.....	4.86	22

NOTES:—Changing conditions, Nov. 1 to Dec. 14.  
Ice conditions, Dec. 15 to 31.

## MONTHLY DISCHARGE of Pipestone River near Laggan, for 1912.

(Drainage area, 122 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January (24-31).....	34.6	28.4	31.0	0.25	0.07	493
February.....	35.0	12.6	26.3	0.22	0.24	1,513
March.....	18.0	7.0	13.9	0.11	0.13	855
April.....	38.4	10.0	23.0	0.19	0.21	1,369
May.....	555.0	30.2	264.7	2.17	2.50	16,276
June.....	980.0	136.0	557.6	4.57	5.10	33,179
July.....	675.0	379.0	465.1	3.84	4.82	28,782
August.....	1,036.0	288.0	510.7	4.13	4.82	31,401
September.....	364.0	133.0	224.6	1.84	2.05	13,364
October.....	147.0	32.0	100.8	0.83	0.96	6,198
November.....	520	32	145	1.19	1.33	8,628
December.....	410	22	96.2	0.788	0.91	5,915
The period.....	.....	.....	.....	.....	22.75	147,978

## FORTYMILE CREEK NEAR BANFF.

This station was established July 31, 1912, by H. C. Ritchie. It is located at the traffic bridge, on the S.W.  $\frac{1}{4}$  Sec. 2, Tp. 26, Rge. 12, W. 5th Mer., on the trail leading from Banff to Castle. It is about a quarter of a mile from the Canadian Pacific Railway depot in Banff and about a mile from the mouth of the creek.

The gauge, which is a plain staff graduated to feet and hundredths, is driven into the bed of the stream near the left bank, about four feet from the bridge, and stayed to two trees. It is referred to a bench mark on the right abutment of the bridge; elevation 8.94 above the zero of the gauge.

The channel is straight for about 50 feet above and 100 feet below the station. Both banks are high and wooded and not liable to overflow. The bed of the stream is of clean sand and gravel and not likely to shift.

Discharge measurements are made from the bridge with a current meter. The initial point for soundings is marked on the hand rail, starting at the left side of the bridge.

The gauge was read during 1912 by C. W. Moffatt, who lives about 200 yards from it.

#### DISCHARGE MEASUREMENTS of Fortymile Creek near Banff, in 1912.

Date. -	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 31.....	H. C. Ritchie.	32	74.2	1.36	3.90	100.95
Aug. 19.....	do	32	96.7	1.95	4.55	188.6
Aug. 31.....	do	32	85.1	1.86	4.30	158.0
Sept. 14.....	do	32.5	76.4	1.61	3.89	123.0
Oct. 1.....	H. R. Cram.	28.5	57.0	1.39	3.43	78.9
Oct. 15.....	do	28	53.5	1.28	3.25	68.2
Sept. 30.....	H. C. Ritchie	26	41.7	0.97	2.92	40.5
Nov. 12.....	do	27.5	46.0	1.20	3.04	55.2
Nov. 26.....	do	28.5	48.1	0.34	2.59	16.5
Dec. 10.....	do	28.5	53.8	0.42	3.30	22.8
Dec. 28.....	do	25.5	44.8	0.93	2.85	42.6

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Fortymile Creek, near Banff, for 1912.

DAY.	August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.93	120	4.20	147	3.43	80	3.12	59	2.75	17.50
2.....	3.95	122	4.17	144	3.42	79	3.12	59	2.97	21.0
3.....	3.90	116	4.12	138	3.40	78	3.10	58	3.10	24.0
4.....	3.90	116	4.05	132	3.43	80	3.08	57	3.05	21.0
5.....	3.90	116	4.00	126	3.40	78	3.08	57	3.02	19.5
6.....	3.85	112	3.97	124	3.37	76	3.06	56	2.96	18.0
7.....	3.83	110	3.95	122	3.35	74	3.06	56	2.93	16.5
8.....	3.80	108	3.95	122	3.35	74	3.06	56	2.90	15.0
9.....	3.70	100	3.93	120	3.35	74	3.06	56	2.90	15.5
10.....	3.70	100	3.93	122	3.34	74	3.04	55	2.94	15.0
11.....	3.70	100	3.95	122	3.32	72	3.04	55	3.04	17.5
12.....	3.65	96	3.93	120	3.30	71	3.04	55	2.60	12.0
13.....	3.63	94	3.90	116	3.29	70	3.04①	53	2.65	13.0
14.....	3.60	92	3.85	112	3.27	69	3.10	56	2.78	16.0
15.....	3.60	92	3.83	110	3.24	67	3.15	59	2.85	19.0
16.....	3.75	104	3.77	106	3.24	67	3.15	58	2.70	17.50
17.....	4.35	164	3.72	101	3.26	68	3.13	55	2.70	18.0
18.....	4.50	182	3.70	100	3.24	67	3.12	53	2.72	20.0
19.....	4.50	182	3.70	100	3.25	68	3.10	50	2.75	22.0
20.....	4.60	194	3.68	98	3.23	66	3.06	46	2.74	23.0
21.....	4.57	190	3.65	96	3.20	64	3.04	43	3.45	59.0
22.....	4.50	182	3.62	94	3.18	63	3.00	39	2.73	26.0
23.....	4.37	166	3.58	91	3.18	63	2.98	36	2.95	37.0
24.....	4.52	184	3.55	88	3.16	62	2.98	34	2.90	37.0
25.....	5.10	254	3.54	87	3.16	62	2.70	31	2.87	38.0
26.....	4.82	220	3.50	85	3.16	62	2.59	16	2.85	40.0
27.....	4.57	190	3.48	83	3.15	61	2.59	16	2.83	41.0
28.....	4.50	182	3.44	80	3.15	61	2.58	15	2.85	44.0
29.....	4.45	176	3.44	80	3.14	60	2.70	17	2.85	44.0
30.....	4.37	166	3.43	80	3.14	60	2.75	17.50	2.83	43.0
31.....	4.27	155	.....	.....	3.14	60	.....	.....	2.83	43.0

① Shifting conditions Nov. 12 to Dec. 28, due to ice.

## SESSIONAL PAPER No. 25d

## MONTHLY DISCHARGE of Fortymile Creek, near Banff, for 1912.

(Drainage area, 58 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
August.....	254	92	145	2.50	2.88	8,916
September.....	147	80	108	1.86	2.08	6,426
October.....	80	60	69	1.19	1.37	4,243
November.....	59	15	45	786	.874	2,678
December.....	59	12	26	448	.516	1,599
The period.....					7.720	23,862

NOTE.—Gauge readings started Aug. 1, 1912.

## BOW RIVER AT BANFF.

This station was established May 25, 1909, by P. M. Sauder. It is located at the highway bridge in the village of Banff, about one mile from the Canadian Pacific Railway Station. It is on the quartering line in the S.  $\frac{1}{2}$  Sec. 35, Tp. 25, Rge. 12, W. 5th Mer., and is about a mile above the mouth of the Spray River, and a short distance below the Vermilion lakes.

The gauge, which is a plain staff, graduated to feet and tenths, is attached to the downstream side of the centre pier. The zero (elev. 92.36) is referred to a permanent iron bench mark (assumed elev. 100.00) situated on the right bank 40 feet east of the southern extremity of the bridge.

The channel is straight for about 300 feet above and 400 feet below the station. Both banks are low and are partly covered with brush and timber, but are not liable to overflow. The bed of the stream is composed of gravel and boulders, the latter making it difficult to obtain accurate soundings at some points. There is a deep hole near the right bank, but the greater part of the cross-section is uniform. The current is sluggish above the station but gets swifter as it approaches the bridge, and breaking into rapids a short distance downstream, reaches the Spray Falls about half a mile below. The stream is divided into four channels by the piers supporting the bridge.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is one and a half feet from the north end of the bridge, and distances are marked on the bottom cord of the downstream side of the bridge at every five feet.

During 1912, the gauge was read by N. B. Sanson, meteorological observer at Banff.

## DISCHARGE MEASUREMENTS of Bow River at Banff, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 1.....	V. A. Newhall.....	53.0	176.5	1.62	1.78	286.0
Jan. 15.....	do.....	50.0	164.0	1.92	2.03	314.8
Jan. 26.....	do.....	56.0	200.0	1.41	2.08	284.0
Feb. 3.....	do.....	51.5	156.4	1.72	1.18	268.4
Feb. 10.....	do.....	50.0	150.5	1.83	1.15	275.0
Feb. 17.....	do.....	50.0	153.0	1.84	1.24	282.2
Feb. 24.....	do.....	50.0	148.0	1.71	1.25	252.5
Mar. 5.....	do.....	50.0	145.2	1.60	1.00	230.8
Mar. 14.....	H. C. Ritchie.....	52.0	153.8	1.32	0.90	202.7
Mar. 25.....	do.....	51.0	139.95	1.65	0.97	230.6
Apr. 8.....	do.....	57.5	150.63	1.72	0.90	238.5
Apr. 13.....	do.....	60.0	163.0	1.83	1.15	298.1
April 22.....	do.....	120.0	475.7	0.64	1.15	307.3
May 7.....	do.....	126.0	542.4	0.897	1.44	486.98
May 20.....	do.....	284.0	931.0	1.83	1.93	1,702.02
June 4.....	do.....	275.5	808.1	1.51	1.53	1,220.45
June 17.....	do.....	320.5	1,377.5	3.42	3.40	4,708.92
July 3.....	do.....	312.5	1,214.38	2.78	3.00	3,381.25
July 15.....	do.....	313.5	1,268.65	2.89	3.00	3,665.88
July 29.....	do.....	314.5	1,209.67	2.67	2.80	3,230.90
Aug. 12.....	do.....	309.5	1,151.10	2.49	2.20	2,864.87
Aug. 26.....	do.....	319.5	1,442.80	3.44	3.60	4,966.10
Sept. 9.....	do.....	302.0	1,016.0	2.05	2.25	2,079.00
Sept. 30.....	H. R. Cram.....	276.0	820.0	1.42	1.65	1,167.00
Oct. 19.....	H. C. Ritchie.....	263.5	760.0	1.25	1.50	951.00
Oct. 31.....	do.....	188.0	583.0	0.92	0.90	537.60
Nov. 11.....	do.....	193.0	621.8	1.15	1.05	713.00
Nov. 25.....	do.....	126.0	534.5	0.88	0.68	472.40
Dec. 9.....	do.....	119.0	477.6	0.90	0.63	431.47
Dec. 23.....	do.....	115.0	458.2	0.86	0.64	392.59



## DAILY GAUGE-HEIGHT AND DISCHARGE of Bow River near Banff, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	① 1.72	284	1.26	268	1.01	238	1.01	246	1.34	398	1.73	1,338
2.....	1.76	285	1.21	267	1.00	235	1.06	249	1.31	379	1.66	1,252
3.....	2.31	286	1.15	265	1.00	233	1.07	251	1.31	379	1.58	1,156
4.....	2.15	282	1.15	266	1.03	233	1.05	254	1.31	379	1.51	1,080
5.....	1.75	280	1.12	267	1.01	231	1.00	252	1.38	428	1.44	1,010
6.....	1.95	282	1.60	283	1.03	228	0.94	252	1.42	456	1.43	1,000
7.....	1.96	283	1.14	270	1.01	226	0.90	255	1.50	570	1.69	1,288
8.....	1.96	284	1.14	271	1.00	224	0.99	261	1.84	1,010	2.16	1,904
9.....	2.20	286	1.12	270	1.00	221	1.01	270	2.08	1,620	2.56	2,590
10.....	2.42	290	1.15	275	1.00	219	1.04	274	1.05	1,600	2.49	2,452
11.....	2.20	294	1.15	276	1.00	216	1.15	302	1.98	1,500	2.57	2,610
12.....	1.99	292	1.12	273	0.98	212	1.11	291	2.02	1,620	2.75	2,990
13.....	2.00	307	1.12	274	0.98	209	1.13	297	2.27	2,170	3.09	3,832
14.....	2.00	313	1.10	274	0.98	205	1.13	297	2.25	2,150	2.98	3,528
15.....	2.03	314	1.12	275	0.98	208	1.13	297	2.20	2,100	3.05	3,720
16.....	1.75	303	1.16	278	0.86	206	1.14	299	2.37	2,470	3.20	4,140
17.....	2.12	312	1.22	280	0.90	210	1.14	299	2.30	2,340	3.39	4,680
18.....	2.35	317	1.22	277	0.94	213	1.13	297	2.12	1,950	3.35	4,560
19.....	2.12	309	1.25	278	0.86	214	1.15	302	2.00	1,700	3.40	4,710
20.....	2.12	303	1.14	270	0.86	216	1.15	302	1.92	1,570	3.46	4,890
21.....	2.00	298	1.24	271	0.87	219	1.15	302	1.80	1,420	3.46	4,890
22.....	1.96	295	1.21	265	0.88	220	1.15	307	1.89	1,528	3.48	4,950
23.....	1.94	291	1.29	260	0.86	221	1.15	302	1.88	1,516	3.52	5,070
24.....	1.78	286	1.25	252	0.86	224	1.20	321	1.86	1,492	3.52	5,070
25.....	1.71	280	1.20	248	0.97	230	1.22	329	2.04	1,726	3.46	4,890
26.....	2.02	282	1.18	246	0.94	232	1.22	329	2.24	2,024	3.50	5,010
27.....	1.95	280	1.10	245	0.95	234	1.22	329	2.49	2,452	3.56	5,192
28.....	1.75	278	1.00	244	1.00	237	1.21	325	2.32	2,152	3.53	5,100
29.....	1.55	273	0.97	241	1.00	241	1.26	348	2.10	1,820	3.20	4,140
30.....	1.40	270			0.96	242	1.34	398	1.98	1,640	3.10	3,860
31.....	1.34	270			0.96	244			1.84	1,468		

① Gauge heights during 1912 are taken from a rod 1.09 lower than that used during 1911.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Bow River near Banff, for 1912.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.95	3,450	2.85	3,210	2.66	2,792	1.64	1,228	1.03	648	0.65	435
2.....	2.88	3,282	2.97	3,502	2.56	2,590	1.63	1,216	1.03	648	0.64	432
3.....	2.96	3,476	2.90	3,330	2.49	2,452	1.60	1,180	1.10	700	0.77	492
4.....	2.79	3,078	2.97	3,502	2.45	2,380	1.73	1,336	1.04	654	0.73	468
5.....	2.81	3,122	2.97	3,502	2.40	2,290	1.66	1,252	1.06	668	0.65	435
6.....	3.13	3,944	3.01	3,608	2.34	2,154	1.61	1,192	1.08	684	0.64	432
7.....	3.24	4,232	2.72	2,924	2.27	2,072	1.59	1,168	1.06	668	0.65	435
8.....	3.30	4,420	2.67	2,814	2.28	2,088	1.59	1,168	1.04	654	0.70	450
9.....	3.34	4,252	2.73	2,946	2.25	2,040	1.57	1,144	1.07	676	0.74	474
10.....	3.21	4,168	2.78	3,056	2.23	2,008	1.54	1,110	1.08	684	0.52	396
11.....	3.17	4,056	2.73	2,946	2.21	1,976	1.51	1,080	1.04	654	0.34	315
12.....	3.12	3,916	2.67	2,814	2.22	1,992	1.46	1,030	1.03	648	0.51	393
13.....	3.26	3,308	2.53	2,530	2.25	2,040	1.44	1,010	1.02	642	0.57	411
14.....	3.25	4,280	2.48	2,434	2.22	1,992	1.43	1,000	1.02	642	0.73	468
15.....	3.07	3,776	2.48	2,434	2.16	1,904	1.40	970	0.72	465	0.65	435
16.....	3.02	3,636	2.69	2,858	2.12	1,848	1.42	990	0.93	688	0.55	405
17.....	2.82	3,144	3.06	3,748	2.07	1,778	1.54	1,110	0.82	522	0.65	435
18.....	2.76	3,012	3.04	3,692	2.04	1,726	1.53	1,100	0.93	588	0.71	456
19.....	2.76	3,012	3.06	3,748	2.01	1,684	1.49	1,060	1.04	654	0.70	450
20.....	2.78	3,056	3.03	3,664	1.95	1,600	1.42	990	0.95	600	0.61	423
21.....	2.76	3,012	3.06	3,748	1.90	1,540	1.38	950	0.95	600	0.53	399
22.....	2.77	3,034	3.06	3,748	1.88	1,516	1.34	910	0.94	594	0.58	414
23.....	2.89	3,306	3.11	3,888	1.88	1,516	1.36	930	0.93	588	0.63	429
24.....	3.17	4,056	3.37	4,620	1.82	1,444	1.32	890	0.93	588	0.66	438
25.....	3.28	4,364	3.85	6,140	1.80	1,420	1.28	850	0.66	435	0.56	408
26.....	3.20	4,140	3.53	5,100	1.77	1,384	1.33	900	0.44	345	0.63	429
27.....	3.05	3,720	3.30	4,420	1.74	1,348	1.28	850	0.45	360	0.66	438
28.....	2.80	3,100	3.24	4,252	1.72	1,324	1.26	830	0.60	418	0.63	429
29.....	2.79	3,078	3.10	3,860	1.66	1,252	1.21	788	0.65	435	0.65	435
30.....	2.77	3,034	2.93	3,402	1.64	1,228	1.04	654	0.73	468	0.63	429
31.....	2.79	3,078	2.75	2,990	.....	.....	1.01	636	.....	.....	0.64	432

## MONTHLY DISCHARGE of Bow River at Banff, for 1912.

(Drainage area, 857 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.		
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	317	270	291	0.34	0.39	17,868
February.....	283	241	266	0.31	0.34	15,312
March.....	244	205	224	0.26	0.30	13,767
April.....	398	246	295	0.34	0.38	17,530
May.....	2,470	379	1,485	1.73	1.99	91,291
June.....	5,192	1,000	3,430	4.00	4.46	204,100
July.....	4,420	3,012	3,566	4.16	4.79	219,260
August.....	6,140	2,434	3,530	4.12	4.75	217,050
September.....	2,792	1,228	1,847	2.16	2.41	109,903
October.....	1,336	636	1,017	1.19	1.37	62,534
November.....	700	345	584	0.68	0.76	34,750
December.....	492	315	429	0.50	0.58	26,378
The year.....	.....	.....	.....	.....	22.52	1,029,743

## SPRAY RIVER NEAR BANFF.

This station was established July 15, 1910, by J. C. Keith. It is located at a traffic bridge about one mile south-east of the village of Banff, on the N. W.  $\frac{1}{4}$  of Sec. 25, Tp. 25, Rge. 12, W. 5th Mer., and about 100 yards above the junction with Bow River.

The gauge, which is of the standard chain type, is nailed to the downstream end of the left, or west, abutment of the bridge, and projects about five feet over the water. The zero of the gauge (elev. 88.71) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the left bank about 50 feet downstream from the bridge.

The channel is straight for 75 feet above and 100 feet below the station. The right bank is low and may overflow at high stages of the stream. The left bank is steep and high. The bed is composed of coarse gravel and is not liable to shift. The current is swift but the surface is free from ripples at the station. A quantity of rock has been dumped into the channel at the left abutment of the bridge and affects the accuracy of the results.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the extreme west end of the bottom chord of the bridge.

During 1912, the gauge was read by N. B. Sanson, meteorological observer at Banff.

## DISCHARGE MEASUREMENTS of Spray River near Banff, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 11.	V. A. Newhall.	26 0	75.40	1.99	5.975	150 0
Jan. 24.	do	29 0	78.45	1.92	5.53	150 5
Jan. 30.	do	29 0	74.10	1.92	5.66	141.91
Feb. 9.	do	28 5	68.60	2.18	5.225	149.50
Feb. 14.	do	28 5	58.45	2.44	5.085	142.80
Feb. 26.	W. Turnbull.	28.5	66.55	1.89	4.995	125.90
Mar. 4.	V. A. Newhall	28 5	68.02	1.24	5.06	84.37
Mar. 16.	H. C. Ritchie	32 0	81.70	1.44	5.27	117.64
Mar. 30.	do	28 5	73.00	1.54	5.10	112.35
April 6.	do	30 0	62.87	1.97	4.73	123.80
April 23.	do	35 5	62.45	2.41	4.69	150.38
May 6.	do	37 5	65.50	2.85	4.79	186.45
May 25.	do	116.5	163.25	3.92	5.86	640.28
June 3.	do	106.5	139.07	3.72	5.65	517.06
July 17.	do	119 5	261.35	5.95	6.85	1,556.28
July 30.	do	117 5	214.75	5.21	6.50	1,118.40
Aug. 15.	do	116 5	169.80	4.45	6.08	754.70
Aug. 27.	do	117 5	187.12	4.65	6.20	871 0
Sept. 10.	do	116 5	172.60	4.38	6.00	757 0
Oct. 1.	H. R. Cram	115 0	128 0	3.93	5.60	504 0
Oct. 14.	do	110 0	113 0	3.73	5.48	420 0
Oct. 30.	H. C. Ritchie	47 5	92 9	3.67	5.27	341 0
Nov. 12.	do	62 5	95 5	3.34	5.18	319 0
Nov. 27.	do	38 5	71.48	2.52	4.94	180.39
Dec. 11.	do	33 0	86.95	1.66	5.25	144.20
Dec. 24.	do	35.0	108 0	2.09	5.77	2 26

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Spray River near Banff, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	6.53	155.0	5.34	144.0	5.08	138.0	4.92	108.0	4.70	152.0	5.79	590.0
2	5.98	150.0	5.36	144.0	4.98	135.0	4.85	108.0	4.72	158.0	⑤ 5.70	540.0
3	6.10	151.0	5.75	150.0	④ 4.98	135.0	4.79	110.0	4.72	158.0	5.69	535.0
4	6.08	151.0	⑤ 5.61	149.0	5.34	129.0	4.73	110.0	4.72	158.0	5.63	504.0
5	5.97	150.0	5.61	149.0	5.43	138.0	4.69	110.0	4.73	160.0	5.57	474.0
6	5.87	150.0	5.48	147.0	5.31	126.0	4.79	128.0	4.76	169.0	5.56	469.0
7	⑤ 5.80	150.0	5.28	143.0	5.30	125.0	④ 4.79	128.0	4.82	186.0	5.62	499.0
8	5.71	149.0	5.21	141.0	5.46	141.0	4.63	120.0	4.88	204.0	5.95	690.0
9	6.72	149.0	5.21	141.0	5.25	120.0	4.66	124.0	5.07	267.0	⑥ 6.00	724.0
10	6.10	151.0	5.21	141.0	⑤ 5.20	115.0	4.68	125.0	5.07	267.0	6.30	943.0
11	5.97	150.0	⑤ 5.21	141.0	5.08	103.0	4.65	126.0	5.07	267.0	6.34	877.0
12	6.00	150.0	5.23	142.0	5.10	105.0	4.65	128.0	⑤ 5.35	374.0	6.44	1065.0
13	5.90	150.0	5.16	140.0	5.02	97.0	4.65	130.0	5.42	403.0	6.66	1306.0
14	⑤ 5.90	150.0	5.06	137.0	4.97	92.0	④ 4.65	132.0	5.66	519.0	6.66	1306.0
15	5.95	150.0	5.04	137.0	5.04	99.0	4.66	134.0	6.02	738.0	6.75	1420.0
16	6.25	152.0	5.57	148.0	5.24	119.0	4.66	135.0	6.26	912.0	⑥ 6.80	1485.0
17	5.75	150.0	5.19	141.0	⑤ 5.20	115.0	4.65	135.0	6.22	881.0	7.55	2530.0
18	5.60	149.0	⑤ 5.19	141.0	5.05	100.0	4.66	136.0	6.06	765.0	7.45	2390.0
19	5.60	149.0	5.25	142.0	5.02	97.0	④ 4.66	136.0	⑥ 6.05	758.0	7.41	2348.0
20	5.61	149.0	5.08	138.0	5.01	96.0	4.67	136.0	5.98	710.0	7.43	2362.0
21	⑤ 5.61	149.0	5.16	140.0	4.96	91.0	4.67	141.0	5.94	683.0	7.40	2320.0
22	5.63	149.0	5.15	140.0	4.96	91.0	4.66	141.0	5.83	614.0	7.29	2166.0
23	5.57	148.0	5.16	140.0	4.88	83.0	4.67	150.0	5.83	614.0	⑦ 7.29	2166.0
24	5.52	147.0	5.06	137.0	④ 4.88	83.0	4.69	149.0	5.82	608.0	7.29	2166.0
25	5.61	149.0	⑤ 5.05	137.0	4.91	86.0	4.72	158.0	5.84	620.0	7.08	1872.0
26	5.55	148.0	5.03	136.0	4.89	89.0	4.72	158.0	⑥ 6.20	865.0	7.15	1970.0
27	6.40	155.0	4.97	135.0	4.89	89.0	4.71	155.0	6.23	888.0	7.12	1928.0
28	⑥ 6.20	152.0	4.90	132.0	4.84	79.0	4.70	152.0	6.17	842.0	6.99	1746.0
29	5.93	150.0	4.90	132.0	4.80	75.0	4.71	155.0	6.05	758.0	6.75	1420.0
30	5.64	149.0			⑤ 5.24	124.0	4.70	152.0	5.95	690.0	⑥ 6.60	1234.0
31	5.47	146.0			⑤ 5.24	135.0			5.87	638.0		

④ Gauge Heights interpolated.

⑤ Shifting conditions from March 30 to April 23.

DAILY GAUGE-HEIGHT AND DISCHARGE of Spray River near Banff, for 1912.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	6.64	1,282	6.43	1,056	①6.05	758	5.59	484	5.24	330	5.35	260
2.....	6.56	1,188	①6.40	1,028	6.01	731	5.61	494	5.21	318	5.49	395
3.....	6.68	1,331	①6.38	1,011	5.98	710	5.59	484	①5.22	322	5.49	395
4.....	6.57	1,200	①6.36	994	5.95	690	5.67	524	5.23	326	5.56	394
5.....	6.58	1,211	6.35	985	①5.93	676	5.62	499	5.21	318	5.85	313
6.....	6.60	1,234	6.33	968	5.91	663	①5.60	489	5.22	322	6.07	256
7.....	①6.75	1,420	6.20	865	5.90	656	5.58	479	5.20	314	5.72	209
8.....	6.91	1,634	6.20	865	①5.95	690	5.59	484	5.19	310	5.65	180
9.....	7.03	1,802	6.18	857	6.01	731	5.58	479	5.22	322	5.55	160
10.....	7.00	1,760	6.16	834	6.02	738	5.56	469	①5.20	314	5.45	152
11.....	7.00	1,760	①6.18	857	6.02	738	5.53	454	5.19	310	5.25	144
12.....	6.99	1,746	6.20	865	6.06	765	5.50	439	5.19	310	5.86	184
13.....	7.00	1,760	6.15	826	6.15	826	①5.50	439	5.20	311	5.87	190
14.....	①7.00	1,760	6.10	792	6.13	812	5.49	434	5.20	308	5.75	208
15.....	①7.00	1,760	6.06	765	①6.06	765	5.46	421	5.10	267	5.65	184
16.....	7.05	1,830	6.15	826	6.00	724	5.47	425	5.11	267	5.56	223
17.....	6.86	1,564	6.34	977	5.98	710	5.40	395	5.15	278	5.80	218
18.....	6.73	1,394	①6.34	977	5.93	676	5.52	449	5.13	267	5.84	215
19.....	6.68	1,331	6.34	977	5.93	676	5.51	444	5.11	257	5.72	179
20.....	6.62	1,258	6.31	951	5.86	632	①5.45	416	5.12	260	5.84	164
21.....	①6.55	1,176	6.32	960	5.83	614	5.41	399	5.11	257	5.76	148
22.....	6.51	1,135	6.31	951	①5.82	608	5.41	399	5.09	243	5.80	194
23.....	6.48	1,105	6.30	943	5.80	596	5.41	399	5.10	248	5.88	250
24.....	6.50	1,125	6.32	960	5.76	572	5.41	399	5.00	210	5.77	226
25.....	6.72	1,382	①6.30	943	5.75	566	5.40	395	4.92	180	5.63	210
26.....	6.67	1,319	6.25	904	5.71	545	5.36	378	4.80	144	6.03	334
27.....	6.68	1,331	6.20	865	5.69	535	①5.35	374	5.02	188	5.92	324
28.....	①6.60	1,234	6.21	873	5.66	519	5.33	366	4.98	174	5.81	278
29.....	6.53	1,156	6.20	865	①5.64	509	5.25	334	5.18	229	5.78	284
30.....	6.47	1,094	6.12	806	5.62	499	5.22	322	5.27	243	5.75	260
31.....	6.44	1,065	6.08	778	.....	.....	5.21	318	.....	.....	5.70	243

①Gauge heights interpolated.

## MONTHLY DISCHARGE of Spray River, near Banff, for 1912.

(Drainage area, 310 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	155.0	146	150	0.48	0.55	9,217
February.....	150	132	141	0.45	0.48	8,104
March.....	141	75	108	0.35	0.40	5,641
April.....	158	108	134	0.43	0.48	7,950
May.....	912	152	517	1.67	1.92	31,789
June.....	2,530	469	1,405	4.05	4.52	83,590
July.....	1,830	1,065	1,398	4.51	5.20	85,960
August.....	1,056	778	907	2.93	3.38	55,781
September.....	826	499	664	2.14	2.39	39,529
October.....	524	318	428	1.38	1.59	26,348
November.....	330	144	272	0.88	0.98	16,161
December.....	395	144	237	0.76	0.88	14,554
The year.....					22.77	385,624

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## CASCADE RIVER AT BANKHEAD.

This station was established August 16, 1911, by P. M. Sauder. It is located at a small log footbridge on the S.E.  $\frac{1}{4}$  Sec. 19., Tp. 26, Rge. 11, W. 5th Mer., in the town of Bankhead on the property of the Bankhead Mines and about 100 feet below their dam.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to the cribbing which supports the north end of the bridge. It is referred to a bench on a tree stump on the left bank a few feet downstream from the bridge; elevation above gauge datum, 5.51 feet.

The channel is straight for 100 feet above and below the station. Both banks are low but are not liable to overflow. The bed is composed of coarse gravel which is not liable to shift. The current is swift.

Discharge measurements are made from the downstream side of the footbridge. The initial point for soundings is the left end of the bridge and is suitably marked.

During 1912, the gauge was read once each day by R. Lewin, a clerk at the Bankhead Mines.

The flow of Cascade river was somewhat irregular during the month of January, owing to the fact that alterations were made at the dam on the outlet of Lake Minnewanka and Bankhead Mines dam on Cascade River just above this gauging station.

## DISCHARGE MEASUREMENTS of Cascade River at Bankhead, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 29 ..	V. A. Newhall	45.5	164.2	0.66	3.03	108.4
Feb. 8 ..	do	43.0	163.7	0.75	3.21	122.3
Feb. 20 ..	do	24.5	22.6	1.83	2.91	41.4
Feb. 27 ..	do	18.5	19.1	3.37	1.78	64.5
Mar. 27 ..	H. C. Ritchie	46.0	81.1	0.86	1.36	69.6
April 12 ..	do	46.0	76.3	0.76	1.32	57.7
April 26 ..	do	44.0	74.6	0.77	1.34	57.3
May 8 ..	do	46.0	100.9	1.73	1.81	174.2
May 21 ..	do	49.0	104.3	2.52	1.97	262.6
June 7 ..	do	44.0	66.6	0.71	1.24	47.3
June 18 ..	do	53.3	182.8	7.92	3.30	1,446.0
July 17 ..	do	39.5	42.4	0.39	0.84	16.4
July 30 ..	do	35.0	44.5	0.34	0.84	15.4
Aug. 17 ..	do	49.0	158.2	7.35	2.96	1,162.1
Aug. 28 ..	do	57.3	192.3	7.48	3.65	1,439.0
Sept. 11 ..	do	59.1	187.0	6.23	3.30	1,164.6
Oct. 2 ..	H. R. Cram	55.2	124.0	2.39	2.48	296.0
Oct. 21 ..	H. C. Ritchie	51.0	121.6	2.01	2.35	244.8
Oct. 29 ..	do	52.0	126.2	2.08	2.35	262.6
Nov. 15 ..	do	51.4	109.8	1.37	2.08	150.6
Nov. 29 ..	do	56.0	146.1	3.02	2.66	447.9
Dec. 12 ..	do	57.0	142.0	2.70	2.58	383.4
Dec. 31 ..	do	52.0	118.4	1.84	2.25	218.0

## DAILY GAUGE-HEIGHT AND DISCHARGE of Cascade River at Bankhead, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2 32	80 8	2 82	101 0	2 42	84 8	1 23	42 6	1 37	61 2	①	Nil.
2.	2 17	74 8	2 77	99 8	2 52	88 8	1 70	135 0	1 39	64 4	1 45	75 0
3.	2 07	70 8	2 72	96 8	2 62	92 8	1 98	261 0	1 43	71 4	1 45	75 0
4.	2 27	78 8	2 67	94 8	2 67	94 8	1 58	102 0	1 45	75 0	1 43	71 4
5.	①		2 62	92 8	3 04	110 0	1 25	45 0	1 55	95 0	②	Nil.
6.			2 57	90 8	3 05	110 0	1 25	45 0	1 55	95 0	1 10	29 0
7.	③		3 28	119 0	3 77	139 0	1 26	46 2	1 62	111 6	1 24	43 8
8.	5 21	196 0	3 22	117 0	3 57	131 0	1 24	43 8	1 82	181 2	2 00	272 0
9.	5 42	205 0	3 15	114 0	3 55	130 0	1 33	55 2	1 90	220 0	1 20	39 0
10.	5 45	206 0	2 77	98 8	3 07	111 0	1 35	58 0	1 92	230 0	1 55	95 0
11.	5 45	206 0	2 60	92 0	2 72	96 8	1 35	58 0	1 96	250 0	1 75	152 0
12.	5 42	205 0	2 47	86 8	2 42	84 8	1 32	53 8	1 99	267 0	1 90	220 0
13.	4 77	179 0	2 32	80 8	2 72	96 8	1 33	55 2	2 10	335 0	2 20	405 0
14.	4 47	167 0	2 25	78 0	2 67	94 8	1 34	56 6	2 22	421 0	2 65	792 0
15.	4 27	159 0	2 30	80 0	3 07	111 0	1 35	58 0	2 28	467 0	2 47	626 0
16.	3 87	143 0	2 22	76 8	2 67	94 8	1 41	67 8	2 36	532 0	3 15	1287 0
17.	3 62	133 0	2 17	74 8	2 37	82 8	1 41	67 8	2 28	467 0	3 33	1478 0
18.	3 72	137 0	2 12	72 8	1 79	61 6	1 42	69 6	2 20	405 0	3 35	1500 0
19.	3 77	139 0	2 07	70 8	1 97	66 8	1 38	62 8	2 25	444 0	3 31	1456 0
20.	4 37	163 0	2 02	68 8	1 87	63 8	1 35	58 0	2 07	316 0	3 29	1434 0
21.	5 01	188 0	2 41	84 4	①		1 31	52 4	2 10	335 0	3 25	1390 0
22.	5 32	201 0	2 14	73 4			1 28	48 6	2 13	355 0	3 25	1390 0
23.	5 35	202 0	2 10	72 0			1 35	58 0	2 12	349 0	3 22	1359 0
24.	5 17	195 0	2 07	70 8			1 35	58 0	2 15	369 0	3 20	1338 0
25.	3 67	135 0	1 77	60 8			1 35	58 0	2 20	405 0	3 15	1287 0
26.	3 62	133 0	1 82	62 8			1 35	58 0	2 25	444 0	3 10	1230 0
27.	3 47	127 0	1 78	61 2	1 36	59 6	1 34	56 6	2 33	508 0	3 00	1135 0
28.	3 27	119 0	2 52	88 8	2 05	303 0	1 34	56 6	2 28	467 0	2 00	272 0
29.	3 11	112 0	2 57	90 8	1 53	91 0	1 32	58 8	2 20	405 0	①	
30.	2 92	105 0			1 48	81 0	1 33	55 2	2 10	335 0		
31.	2 87	103 0			1 35	58 0			1 98	261 0		

① Ice flooded.

② Rod carried out by ice.

③ Dam closed.—River dry.

④ River practically dry.

⑤ Extreme fluctuations caused by dam above station.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Cascade River at Bankhead, for 1912.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.		
	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
1.....	②	15 00	0 78	13	2 15	174	2 46	308	2 65	437	2 60	398	
2.....	②	14 80	0 79	14	2 15	174	2 46	308	2 66	445	2 53	350	
3.....	②	14 80	0 75	10	2 14	171	2 46	308	2 64	429	2 49	326	
4.....	②	14 80	0 77	12	2 13	168	2 46	308	2 45	302	2 45	302	
5.....	②	14 70	0 78	13	2 15	174	2 47	314	2 25	212	2 30	232	
6.....	③	14 60	0 78	10	2 15	174	2 47	314	2 28	224	2 15	174	
7.....	①	1 15	34	0 75	10	Nil.	2 46	308	2 25	212	2 20	193	
8.....	①	3 15	1,287	0 78	13	Nil.	2 46	308	2 25	212	2 18	186	
9.....	①	3 25	1,390	1 65	120	3 35	1,132	2 45	302	2 28	224	2 17	182
10.....	①	2 75	888	2 03	291	3 28	1,061	2 45	302	2 27	220	2 15	174
11.....	①	3 35	1,500	2 08	322	2 02	135	2 43	292	2 27	220	2 75	522
12.....	①	3 22	1,359	2 06	309	2 10	157	2 42	287	2 27	220	2 60	398
13.....	①	3 12	1,256	2 20	405	2 22	201	2 38	267	2 28	224	2 58	384
14.....	①	3 08	1,216	2 50	654	2 48	320	2 33	245	2 11	160	2 50	332
15.....	①	3 09	1,205	2 55	700	2 50	332	2 32	240	2 07	149	2 45	302
16.....	①	17 0	2 93	1,065	2 60	398	2 30	232	2 12	164	2 42	286	
17.....	①	16 44	②	2 97	1,105	2 62	414	2 31	236	2 30	232	2 45	302
18.....	①	16 32	3 47	1,695	2 65	437	2 35	253	2 70	479	2 70	479	
19.....	①	16 12	3 55	1,650	1 30	29	2 36	258	1 95	117	2 68	461	
20.....	①	16 00	3 55	1,625	1 35	32	2 37	262	1 93	113	2 64	429	
21.....	①	15 90	3 53	1,560	2 45	302	2 36	258	1 90	107	2 60	398	
22.....	①	15 90	3 53	1,525	2 37	262	2 36	258	1 90	107	2 55	362	
23.....	①	15 80	3 50	1,450	2 43	292	2 35	253	1 95	117	2 50	332	
24.....	①	15 70	3 42	1,330	2 45	302	2 35	253	1 97	122	2 43	292	
25.....	①	15 60	3 44	1,325	2 46	308	2 35	253	2 30	232	2 75	522	
26.....	①	15 60	3 54	1,395	2 45	302	2 35	253	2 95	724	2 40	276	
27.....	①	15 45	3 73	1,570	2 46	308	2 35	253	2 95	724	2 35	253	
28.....	①	15 40	③	3 65	1,443	2 45	302	2 35	253	2 95	724	2 31	236
29.....	①	15 38	3 55	1,336	2 46	308	2 35	253	2 66	445	2 25	212	
30.....	①	0 84	15 39	3 50	1,285	2 46	308	2 47	314	2 62	414	2 27	220
31.....	①	0 72	8 50	2 15	174	.....	2 55	362	.....	.....	2 25	212	

① Changing conditions from Aug. 17 to Aug 28.

② Gauge not read. Discharge estimated.

③ Irregularities in July Discharge due to operation of dam above.

## MONTHLY DISCHARGE of Cascade River at Bankhead, for 1912.

(Drainage area, 248 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January (1-4, 8-31).	206 0	70 8	148 7	0 61	0 62	8,258
February.....	119 0	60 8	85 2	0 34	0 37	4,901
March (1-21, 27-31) .	303 0	58 0	101 6	0 41	0 38	5,038
April.....	261 0	42 6	66 6	0 27	0 30	3,963
May.....	532 0	62 1	301 4	1 22	1 41	18,532
June.....	1,500 0	Nil.	648 4	2 61	2 91	38,583
July.....	1,500 0	8 5	337 8	1 36	1 57	20,767
August.....	1,695 0	10 0	788 0	3 18	3 67	48,452
September.....	437 0	Nil.	289 2	1 17	1 31	17,209
October.....	1,362 0	232 0	278 0	1 12	1 29	17,094
November.....	724 0	107 0	290 4	1 17	1 31	17,280
December.....	522 0	74 0	313 8	1 27	1 46	19,295
The period. . . . .	.....	.....	.....	.....	16 60	219,372



## BOW RIVER NEAR KANANASKIS.

This station was established on March 10, 1912, by H. C. Ritchie, to replace the old station near Morley. It is located at the Canadian Pacific Railway bridge on the N.W.  $\frac{1}{4}$  Sec. 32, Tp. 24, Rge. 8, W. 5th Mer.

The gauge, which is of the chain type, is securely fastened to the inside of the guard rail on the first span from the right bank. The length of the chain from the marker to the bottom of the weight is 18.48 feet. The zero of the gauge (elev. 91.05) is referred to a bench mark (assumed elev. 100.00) on the side of the east pier.

The channel is straight for 600 feet above and 900 feet below the station. The right bank is high and is not liable to overflow, while the left is low and is liable to overflow at high stages of the stream. Both banks have considerable growths of willow and cottonwood. The bed of the stream is composed of rock with very few boulders and will not change. The current is fairly swift at this section.

Discharge measurements are made from the Canadian Pacific Railway bridge with a meter at high stages, and at low stages with meter and rods by wading. The initial point for soundings is at the end of the span on the left bank. The rail of the bridge is chained and the chainage from the initial point is marked on it.

During 1912, the gauge was read once each day by the Calgary Power Company per J. Gipson.

The plant of the Calgary Power Company is located some three miles below this station.

## DISCHARGE MEASUREMENTS of Bow River near Kananaskis, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
① Feb. 29.	V. A. Newhall.	270.00	302.25	1.94	.....	587.18
① Mar. 10.	H. C. Ritchie.	255.00	267.00	2.174	2.00	580.45
① Mar. 20.	do	272.00	244.55	2.27	1.97	555.30
① April 2.	do	338.00	271.25	2.09	1.84	567.99
April 15.	do	346.50	287.90	2.14	1.83	617.22
April 29.	do	349.00	300.50	2.27	1.85	681.88
May 13.	do	367.00	423.70	3.25	2.23	1,388.39
May 28.	do	403.00	783.55	5.78	3.03	4,528.61
June 11.	do	402.00	731.00	5.51	2.94	4,027.07
June 25.	do	422.00	1,042.98	7.35	3.70	7,672.14
July 9.	do	416.00	1,033.85	7.34	3.70	7,591.62
July 25.	do	412.00	986.40	6.47	3.60	6,403.36
Aug. 6.	do	406.5	827.48	6.21	3.20	5,139.39
Aug. 20.	do	409.00	980.20	6.61	3.60	6,477.10
Sept. 6.	do	399.00	698.60	5.41	2.87	3,780.00
Sept. 24.	H. R. Cram.	397.00	606.00	4.59	2.54	2,784.00
Oct. 9.	do	381.00	556.00	3.97	2.50	2,207.00
Oct. 23.	H. C. Ritchie.	372.00	488.00	3.41	2.40	1,662.00
Nov. 6.	do	359.00	412.00	3.51	2.22	1,448.00
① Nov. 19.	do	373.00	422.7	3.23	2.23	1,366.70
① Dec. 3.	do	319.00	500.00	2.82	3.16	1,212.40
① Dec. 17.	do	180.00	555.4	1.57	4.32	871.00

① Ice conditions.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Bow River, near Kananaskis, for 1912.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1.98	578	1.87	665	2 53	2,428
2.....			1.97	577	1.85	635	2.51	2,356
3.....			1.86	650	1.88	680	2.50	2,320
4.....			1.87	665	1.87	695	2.47	2,221
5.....			1.86	650	1.88	680	2.45	2,155
6.....			1.85	635	1.87	665	2 41	2,023
7.....			1.83	605	1.89	695	2 37	1,894
8.....			1.85	635	1.93	764	2 52	2,392
9.....			1.85	635	2.09	1,097	2.71	3,100
10.....	2 00	580	1.88	680	2.08	1,074	2.96	4,100
11.....	1 99	579	1.90	710	2.10	1,120	2 98	4,180
12.....	1.98	578	1.88	680	2.15	1,255	3 04	4,432
13.....	1.92	572	1.89	695	2.23	1,474	3 06	4,518
14.....	1 85	575	1 86	650	2.36	1,862	3.57	6,927
15.....	1.78	586	1 87	665	2.54	2,464	3 61	7,131
16.....	1.97	577	1.88	680	2.86	3,700	3.74	7,794
17.....	1.95	575	1.80	560	2.89	3,820	3 80	8,100
18.....	1.96	576	1.82	590	2.86	3,700	3.74	7,794
19.....	1.99	579	1.79	546	2.85	3,660	3.75	7,845
20.....	1.97	577	1 83	605	2.63	2,794	3.73	7,743
21.....	1.97	577	1 82	590	2.50	2,320	3.76	7,896
22.....	1.94	574	1.83	605	2.49	2,287	3 72	7,692
23.....	1.95	575	1 84	620	2.46	2,188	3.63	7,233
24.....	1.92	572	1 83	605	2.43	2,089	3.64	7,284
25.....	1.90	570	1 80	560	2.61	2,718	3.70	7,590
26.....	1.89	571	1 84	620	2.79	3,420	3.66	7,386
27.....	1.88	572	1.85	635	2.88	3,780	3.62	7,182
28.....	1 87	573	1.84	620	3.03	4,389	3.64	7,284
29.....	2 20	640	1.85	635	3.00	4,200	3.65	7,335
30.....	2.10	630	1 85	635	2.98	4,180	3.37	5,919
31.....	2 10	630	..	.....	2.70	3,060	.....	.....

DAILY GAUGE-HEIGHT AND DISCHARGE of Bow River, near Kananaskis, for 1912.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3.26	5,410	3.18	5,050	3.08	4,604	2.54	2,464	2.39	1,958	3.34	710
2	3.17	5,005	3.21	5,185	3.01	4,303	2.52	2,392	2.47	2,221	3.32	746
3	3.09	4,647	3.19	5,095	2.97	4,140	2.50	2,320	2.40	1,991	3.39	890
4	3.06	4,518	3.22	5,230	2.95	4,060	2.49	2,287	2.33	1,766	3.33	854
5	3.04	4,432	3.25	5,365	2.99	4,220	2.53	2,428	2.27	1,586	3.26	800
6	3.05	4,475	3.20	5,140	2.89	3,820	2.50	2,320	2.21	1,418	3.04	635
7	3.42	6,162	3.16	4,960	2.80	3,460	2.52	2,392	2.19	1,363	2.93	490
8	3.56	6,876	3.11	4,735	2.80	3,460	2.53	2,428	2.18	1,336	2.74	420
9	3.70	7,590	3.07	4,561	2.79	3,420	2.52	2,392	2.15	1,255	2.47	360
10	3.72	7,692	3.15	4,915	2.81	3,500	2.49	2,287	2.16	1,282	2.49	300
11	3.69	7,539	3.09	4,647	3.06	4,518	2.47	2,221	2.15	1,255	2.97	324
12	3.67	7,437	3.05	4,475	3.07	4,561	2.45	2,155	2.16	1,282	3.51	360
13	3.74	7,794	3.00	4,260	3.04	4,432	2.44	2,122	2.18	1,336	3.53	420
14	3.84	8,308	2.96	4,100	2.74	3,220	2.45	2,155	2.15	1,255	3.32	300
15	3.66	7,386	2.97	4,140	2.71	3,100	2.43	2,089	2.10	1,120	3.70	360
16	3.62	7,182	2.99	4,220	2.73	3,180	2.44	2,122	1.99	872	4.16	420
17	3.54	6,774	3.27	5,455	2.69	3,022	2.48	2,254	2.48	① 1,360	4.32	710
18	3.43	6,213	3.52	6,672	2.67	2,946	2.46	2,188	2.31	1,228	5.00	890
19	3.48	6,468	3.61	7,131	2.63	2,794	2.47	2,221	2.24	1,255	5.68	1,120
20	3.37	5,919	3.60	7,080	2.60	2,680	2.45	2,155	2.22	1,250	6.33	1,390
21	3.31	5,637	3.67	7,437	2.58	2,608	2.43	2,089	2.19	1,174	6.06	1,120
22	3.06	4,518	3.63	7,233	2.56	2,536	2.42	2,056	2.15	1,120	6.10	1,120
23	3.12	4,780	3.60	7,080	2.53	2,428	2.45	2,155	2.12	872	5.72	890
24	3.37	5,919	3.69	7,539	2.58	2,608	2.43	2,089	2.14	1,170	5.60	710
25	3.64	7,284	3.77	7,947	2.60	2,680	2.32	1,734	2.32	1,070	5.37	560
26	3.72	7,692	3.71	7,641	2.57	2,572	2.39	1,958	2.35	800	5.37	560
27	3.37	5,919	3.73	7,743	2.59	2,644	2.39	1,958	2.94	854	4.94	560
28	3.25	5,365	3.70	7,590	2.57	2,572	2.35	1,830	2.95	836	4.56	590
29	3.18	5,050	3.69	7,539	2.53	2,428	2.32	1,734	3.04	710	4.63	560
30	3.19	5,095	3.65	7,335	2.50	2,320	2.38	1,926	2.98	746	4.42	632
31	3.16	4,960	3.41	6,111	..	..	2.40	1,990	..	..	4.44	532

① Ice conditions.

## MONTHLY DISCHARGE of Bow River near Kananaskis, for 1912.

(Drainage area, 1304 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (10-31).....	640	570	580 50	45	37	34,542
April.....	710	546	627.00	48	54	37,321
May.....	4,389	635	2,199.68	1.69	1.95	135,240
June.....	8,100	1,894	5,475.13	4.20	4.48	325,753
July.....	8,308	4,432	6,130.0	4.70	5.42	376,920
August.....	7,947	4,100	5,923.0	4.54	5.23	364,193
September.....	4,604	2,320	3,294.0	2.53	2.82	196,006
October.....	2,464	1,734	2,158	1.65	1.90	132,688
November.....	2,221	710	1,259	0.966	1.08	74,920
December.....	1,390	300	656	0.503	0.58	40,336
The period.....					24.37	1,717,919

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## KANANASKIS RIVER NEAR KANANASKIS.

This station was established August 31, 1911, by P. M. Sauder. It is located on the N.W.  $\frac{1}{4}$  Sec. 33, Tp. 24, Rge. 8, W. 5th Mer. The station is about three miles east of Kananaskis station and about one and one-half miles west of Horseshoe Falls siding, about 350 yards north and east of the Canadian Pacific Railway bridge spanning the river and about 200 feet above the mouth of the stream.

The gauge, which is of the standard chain type, is supported by two posts in the right bank, about eight feet upstream from the cable. It is referred to a bench mark on a stump six feet upstream, elevation 15.09.

The channel is straight for 400 feet above and 50 feet below the station. Both banks are high, the right bank is composed of rock and the left of coarse gravel. The bed of the stream is solid rock near the right bank and coarse gravel throughout the remainder of the cross-section. The current is very swift.

Discharge measurements are made from a car suspended from a cable, a current meter being used for velocity observations. The initial point for soundings is a spike driven in the upstream side of the cable support on the left bank and distances are marked at every five feet by a tagged wire.

The gauge was read once each day during 1912, by the Calgary Power Company, the observations being taken by J. Gipson.

## DISCHARGE MEASUREMENTS of Kananaskis River near Kananaskis, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 3	V. A. Newhall	57.0	160.1	0.98	8.34	141.15
Jan. 20	do	30.0	43.25	2.88	5.98	124.70
Feb. 1	do	60.0	70.80	2.26	6.23	160.20
Feb. 13	do	58.0	60.50	2.24	6.35	135.80
Feb. 21	do	60.0	64.50	2.19	6.52	141.15
Mar. 1	do	60.0	58.50	1.79	6.04	104.68
Mar. 12	H. C. Ritchie	60.0	69.00	1.87	6.47	128.00
Mar. 21	do		Slush	ice to bottom.		
April 3	do	59.0	58.40	2.20	5.10	128.71
April 16	do	60.0	64.50	2.20	5.08	143.44
April 30	do	58.0	64.38	2.29	5.12	147.89
May 14	do	60.0	108.70	4.02	5.98	427.23
May 27	do	63.5	151.93	5.68	6.75	863.33
June 12	do	62.0	141.55	5.47	6.62	774.09
June 26	do	65.0	271.86	6.11	8.37	1,661.56
July 10	do	66.0	321.30	8.43	8.92	2,707.95
July 25	do	65.0	245.40	7.14	7.87	1,715.28
Aug. 7	do	63.5	205.35	6.39	7.10	1,312.59
Aug. 21	do	64.0	204.70	5.89	7.20	1,205.00
Sept. 6	do	65.1	144.40	5.11	6.34	738.30
Sept. 25	do	60.0	116.00	4.80	6.05	558.00
Oct. 8	do	60.0	96.80	3.77	5.60	365.00
Oct. 22	do	59.0	96.20	4.07	5.49	391.50
Nov. 5	do	58.0	84.70	3.55	5.24	301.00
Nov. 19	do	57.5	82.53	3.48	5.16	287.00
Dec. 4	do	60.0	130.00	2.30	5.94	299.14
Dec. 17	do	56.0	121.00	1.58	5.90	190.40

## DAILY GAUGE HEIGHT AND DISCHARGE of Kananaskis River near Kananaskis, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	7 00	138.00	6.50	131.75	6.17	127.63	5.00	120.00	5.14	154.40	6.32	626.40
2	7 30	141.75	6.53	132.13	6.16	127.50	5.02	124.80	5.15	157.00	6.22	574.40
3	7 50	144.25	6.50	131.75	6.14	127.25	4.97	112.80	5.15	157.00	6.17	548.40
4	8 80	160.50	6.53	132.13	6.08	126.50	4.98	115.20	5.16	159.60	6.14	532.80
5	8 30	154.25	6.52	132.00	6.10	126.75	4.98	115.20	5.17	162.20	6.08	502.40
6	8 30	154.25	6.50	131.75	6.09	126.63	4.95	108.00	5.19	167.40	6.03	478.40
7	8 30	154.25	6.49	131.63	6.05	126.13	5.00	120.00	5.21	173.00	6.09	507.20
8	7 80	148.00	6.47	131.37	6.03	125.88	5.03	127.20	5.40	230.00	6.18	553.60
9	7 30	141.75	6.20	128.00	6.04	126.00	5.01	122.40	5.58	292.80	6.47	707.20
10	7 40	143.00	6.10	126.75	6.18	127.75	5.01	122.40	5.00	120.00	6.56	757.60
11	7 50	144.25	5.45	118.62	6.25	128.68	5.03	127.20	5.49	260.60	6.62	791.20
12	7 50	144.25	5.43	118.38	6.49	131.63	5.02	124.80	5.48	257.20	6.76	872.00
13	7 30	141.75	6.35	129.63	6.50	131.75	5.04	129.6	5.64	314.40	6.99	101.00
14	7 20	140.50	6.34	129.75	6.49	131.63	5.03	127.20	5.98	455.20	7.10	1080.00
15	7 10	139.25	6.29	129.13	6.50	131.75	5.04	129.60	6.35	642.00	7.97	1740.00
16	6.50	131.75	6.27	128.87	6.53	132.13	5.06	134.40	6.71	842.00	9.21	2877.20
17	6.40	130.50	6.28	129.00	6.37	130.13	5.03	127.20	6.36	647.20	9.35	3006.00
18	6.30	129.25	6.29	129.13	6.38	130.25	5.05	132.00	6.42	670.20	9.15	2822.00
19	6.00	125.50	6.28	129.00	6.37	130.13	5.00	120.00	6.45	696.00	9.12	2794.40
20	5.98	125.25	6.29	129.13	6.39	130.37	5.01	122.40	6.32	626.40	9.04	2720.80
21	5.95	124.88	6.26	128.75	6.38	130.25	5.06	134.40	6.24	584.80	8.78	2481.60
22	5.93	124.63	6.22	128.25	6.40	130.50	5.05	132.00	6.15	538.00	8.73	2435.60
23	5.90	124.25	6.24	128.50	6.39	130.37	5.04	129.60	6.20	564.00	8.64	2260.80
24	5.87	123.88	6.23	128.37	6.40	130.50	5.06	134.40	6.25	590.00	8.48	2205.60
25	5.85	123.63	6.25	128.63	6.40	130.50	5.10	144.00	6.30	616.00	8.44	2168.80
26	5.85	123.63	6.23	128.37	6.43	130.87	5.11	146.6	6.54	746.40	8.40	2132.00
27	5.83	123.38	6.23	128.37	6.45	131.13	5.09	141.60	6.75	866.00	8.30	2048.00
28	5.83	123.38	6.21	128.12	6.43	130.87	5.06	134.40	6.67	819.20	8.15	1920.00
29	5.80	123.00	6.18	127.75	6.43	130.87	5.09	141.60	6.60	780.00	8.01	1800.00
30	6.00	125.50	...	...	6.45	131.13	5.12	149.20	6.55	752.00	8.78	2520.00
31	6.20	128.00	...	...	5.02	113.25	...	...	6.52	735.20	...	...

## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Kananaskis River near Kananaskis, for 1912.  
*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	7 62	①1.488	7 20	1.248	6 65	898	5 67	414	5 28	311	5 32	148
2.....	7 58	1.464	7 17	1.228	6 51	818	5 63	402	5 27	309	5 41	176
3.....	9 52	3.210	7 13	1.202	6 34	722	5 60	392	5 29	314	5 90	298
4.....	7 43	1.360	7 15	1.215	6 27	684	5 63	402	5 27	309	5 94	296
5.....	7 36	1.320	7 24	1.277	6 35	728	5 66	411	5 24	302	6 30	440
6.....	7 46	1.408	7 17	1.228	6 36	734	5 62	398	5 23	299	6 31	436
7.....	7 72	1.608	7 08	1.169	6 29	695	5 60	392	5 23	299	5 71	204
8.....	8 63	2.520	7 03	1.137	6 30	700	5 59	389	5 21	294	5 64	176
9.....	8 84	2.632	6 98	1.105	6 32	711	5 61	395	5 23	299	5 96	272
10.....	8 90	①2.688	6 90	1.052	6 30	700	5 57	384	5 22	297	5 49	120
11.....	8 89	2.690	7 05	1.150	6 32	711	5 60	392	5 20	292	5 28	72
12.....	8 69	2.495	7 03	1.137	6 35	728	5 62	398	5 23	299	5 30	72
13.....	8 70	2.504	6 92	1.065	6 40	756	5 57	384	5 21	294	5 42	88
14.....	9 12	2.890	6 84	1.014	6 38	745	5 56	381	5 19	290	5 64	136
15.....	8 82	2.614	6 87	1.033	6 33	717	5 53	372	5 16	284	⑤5 70	148
16.....	8 49	2.311	6 90	1.052	6 31	706	5 54	375	5 09	270	5 91	208
17.....	8 50	2.320	7 26	1.292	6 26	679	5 58	386	5 10	272	5 90	192
18.....	7 86	1.744	7 32	1.334	6 19	643	5 57	384	5 17	285	5 86	190
19.....	7 58	1.525	7 35	1.356	6 19	643	5 55	378	5 16	284	5 84	188
20.....	7 55	1.503	7 24	1.277	6 08	588	5 56	381	5 12	256	5 96	193
21.....	9 53	3.258	7 20	1.248	6 00	548	5 54	375	5 13	244	5 93	192
22.....	9 24	3.001	7 18	1.235	5 98	538	5 49	362	5 10	216	5 60	178
23.....	7 32	1.334	7 15	1.215	6 01	553	5 48	359	5 09	200	6 08	198
24.....	7 53	1.488	7 20	1.248	6 07	583	5 46	354	5 11	192	5 91	191
25.....	7 84	1.728	8 03	1.563	6 12	608	5 45	352	5 06	156	⑥6 00	196
26.....	7 78	1.680	7 60	1.860	6 03	663	5 44	350	5 05	144	6 64	216
27.....	7 71	1.624	9 69	3.115	5 84	476	5 42	345	5 10	144	6 30	200
28.....	7 54	1.496	9 48	3.222	5 77	449	5 44	350	5 08	120	6 52	208
29.....	7 40	1.392	9 34	3.093	5 73	435	5 44	350	5 20	136	6 75	224
30.....	7 31	1.327	7 12	1.195	5 70	424	5 38	335	5 30	152	6 89	232
31.....	7 22	1.262	6 93	1.572	.....	.....	5 29	314	.....	.....	7 10	248

① Shifting conditions July 1 to July 10.

② Gauge heights interpolated.

## MONTHLY DISCHARGE of Kananaskis River near Kananaskis, for 1912.

(Drainage area, 406 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	160	123	136	0.33	0.38	8,332
February.....	132	118	129	0.32	0.34	7,409
March.....	132	113	129	0.32	0.37	7,926
April.....	149	108	128	0.32	0.36	7,635
May.....	866	120	477	1.17	1.35	29,305
June.....	3,006	478	1,582	3.90	4.35	94,138
July.....	3,258	1,262	1,996	4.91	5.66	122,729
August.....	3,222	1,014	1,424	3.51	4.05	87,558
September.....	898	424	653	1.61	1.80	38,856
October.....	414	314	376	0.926	1.07	23,119
November.....	314	120	252	0.621	0.69	14,995
December.....	440	72	204	0.502	0.58	12,543
The year.....	.....	.....	.....	.....	21.00	454,545

## GHOST RIVER AT GILLIES' RANCH.

This station was established on August 17, 1911, by L. R. Brereton. It is located on the N.E.  $\frac{1}{4}$  Sec. 23, Tp. 26, Rge. 6, W. 5th Mer., about one quarter of a mile below Gillies' ranch buildings.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post sunk in the bed of the stream at the left bank. The zero of the gauge (elev. 90.87) is referred to a permanent iron bench mark (assumed elev. 100.00) situated on the right bank of the river 270 feet due north of the quarter mound on the east boundary of Sec. 23, Tp. 26, Rge. 6, W. 5th Mer., and 469 feet east and slightly south of the gauge.

The channel at the bridge is straight for about 150 feet above and below the station. The right bank is high and composed of solid rock, and cannot overflow. The left is low, composed of gravel, slightly covered with trees, but is not liable to overflow. The bed of the stream is composed of coarse gravel and may shift in high stages.

During 1912, the gauge was read by Miss E. Gillies.

## DISCHARGE MEASUREMENTS of Ghost River at Gillies' Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Feb. 2	V. A. Newhall	31 0	50 20	2 64	2 00	132.60 ①
Feb. 12	do	27 0	39 40	2 62	1 53	103.27
Feb. 22	do	29 0	45 25	2 10	1 80	95 01
Mar. 2	do	26 0	38 80	1 82	1 36	70.75
Mar. 13	H. C. Ritchie	30 0	38 00	2 88	1 06	109.60
Mar. 23	do	25 0	43 00	2 44	1 76	104.90 ①
April 17	do	47 0	58 10	2 61	0 99	152.02
May 16	do	68 0	145 00	2 35	1 51	340.64
May 30	do	63 0	105 10	1 41	1 00	148.62
May 30	do	51 0	66.60	1 98	1 00	132.00
June 14	do	63 0	113 05	1 24	1 00	140.15
June 27	do	62.5	116.57	1 79	1 02	207.91
July 11	do	93.5	246.4	5 41	4 00	1,332.7
July 26	do	86 0	269.8	5 42	4 10	1,460.4
Aug. 8	do	81.5	156.5	4 06	3 05	634.4
Aug. 22	do	81 0	183.1	3 44	3 15	630 0
Sept. 4	do	79 0	184 0	3 24	3 12	598 0
Sept. 26	H. R. Cram	78.5	155.0	3 01	2 87	466 0
Oct. 11	do	77 0	146.0	2 85	2 70	417 0
Oct. 24	H. C. Ritchie	73 0	130 0	2 48	2 44	322 0
Nov. 8	do	69 0	121.2	2 27	2 35	276.0
Nov. 21	do	70 0	114.5	2 26	2 30	258.4
Dec. 5	do	50 9	75.2	2.57	2 22	193.3 ①
Dec. 19	do	50 3	80.4	2 18	2 30	176.0 ②

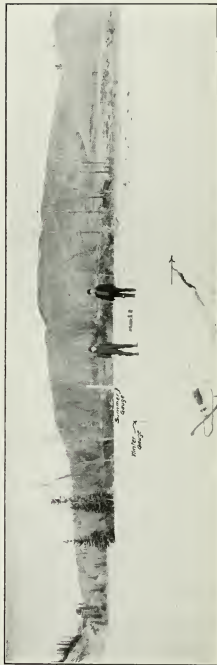
① Ice conditions, Feb. 2 to Mar. 23.

② do Dec. 5 to Dec. 31.



Gauging Kananaskis River near Kananaskis, in winter. Taken by V. A. Newhall.

PLATE No. 24



Gauging Ghost River at Gillies' Ranch, in winter. Taken by V. A. Newhall.

PLATE No. 25





## SESSIONAL PAPER No. 25d

## DAILY GAUGE HEIGHT AND DISCHARGE of Ghost River at Gillies' Ranch, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3 85	142 00①	1 61	97 20	2 02	105 40	3 22	129 40	1 55	362 50	1 04	153 40
2.....	3 85	142 00⑤	1 56	96 40	1 12	104 80	3 06	126 20	1 40	301 00	1 04	153 40
3.....	3 85	142 00	1 56	96 40	1 61	97 20	3 01	125 20	1 03	149 30	0 95	116 50
4.....	3 85	142 00	1 56	96 40	1 52	95 80	2 81	121 20	1 40	301 00	1 30	260 00
5.....	3 85	142 00⑤	1 54	96 10	1 61	97 20	2 56	116 20	2 00	547 00	0 95	116 50
6.....	3 56	136 20	2 11	107 20	3 41	④98 00	1 56	96 40	1 95	526 50	0 94	112 40
7.....	3 81	141 20	1 89	102 80	1 21	99 70	1 86	102 20	2 39	706 90	0 93	108 30
8.....	3 90	143 20	1 61	97 20	2 56	116 20	1 90	103 00	2 49	747 90	0 90	96 00
9.....	3 87	142 40	1 59	96 85	3 51	135 20	2 16	108 20	2 30	670 00	1 30	260 00
10.....	3 91	143 20	1 58	96 70	2 76	120 20	1 56	96 40	1 69	419 90	0 93	108 30
11.....	3 96	144 20	1 59	96 85	2 77	120 40	1 46	95 70	1 35	280 50	0 92	104 20
12.....	3 86	142 20	1 56	96 40	2 90	123 00	1 51	95 65①	1 40	301 00	0 90	96 00
13.....	3 94	143 8	1 61	97 20	0 90	124 00	1 20	120 00②	1 45	321 50	1 02	145 20
14.....	3 95	144 00	1 58	96 70	0 86	126 20	1 10	150 00③	1 54	358 40	1 00	137 00
15.....	3 62	137 40	1 56	96 40	3 11	127 20	1 10	178 00	1 66	407 60	2 80	875 00
16.....	3 44	133 80	1 56	96 40	2 76	120 20	1 05	157 50④	1 60	383 00	3 30	1080 00
17.....	3 25	130 00	1 86	102 20	1 36	96 40	1 00	137 00	1 65	403 50	4 01	1371 10
18.....	2 95	124 00	1 43	95 85	1 41	95 95	1 00	137 00	1 50	342 00	2 85	895 50
19.....	3 09	126 80	1 60	97 00	0 89	124 90	0 95	116 50	1 59	378 90	1 80	465 00
20.....	3 15	128 00	1 11	105 40	0 91	123 10	0 89	91 50	1 52	350 20	1 96	530 60
21.....	3 05	126 00	2 03	105 60	2 76	120 20	0 86	79 60	1 80	465 00	1 45	321 50
22.....	2 70	119 00	1 72	99 40	2 51	115 20	0 85	75 50	1 35	280 50	1 02	145 20
23.....	2 36	112 20	1 11	105 40	1 44	95 80	0 95	116 50	1 20	219 00	1 01	141 10
24.....	2 25	110 00	1 81	101 20	2 42	113 40	0 99	132 90	1 50	342 00	1 02	145 20
25.....	2 15	108 00	1 71	99 20	3 06	126 20	1 05	157 50	1 40	301 00	1 02	145 20
26.....	1 95	104 00	1 12	104 80	2 36	112 20	1 05	157 50	1 25	239 50	1 02	145 20
27.....	1 90	103 00	1 51	95 65	2 54	115 80	1 03	149 30	1 30	260 00	1 01	141 10
28.....	1 80	101 00	1 61	97 20	3 46	134 20	1 00	137 00	1 35	280 50	1 01	141 10
29.....	1 74	99 80	1 01	112 10	3 61	137 20	1 00	137 00	1 10	178 00	1 20	219 00
30.....	1 76	100 20			3 16	128 20	1 50	342 00	1 00	137 00	1 30	260 00
31.....	1 75	100 00			3 21	129 20			0 99	132 90		

① Ice conditions Jan. 1 to Apr. 12.

② Gauge heights interpolated Jan. 1 to 5 and Apr. 13 to 16.

③ Shifting conditions Apr. 13 and 14.

④ Gauge height raised by ice jam.

DAILY GAUGE-HEIGHT AND DISCHARGE of Ghost River at Gillies' Ranch, for 1912.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.35	690	2.45	732	2.15	609	1.85	486	1.39	297	1.40	276
2.....	1.20	219	2.40	711	2.10	588	1.84	482	1.44	317	1.45	294
3.....	1.80	465	2.30	670	2.10	588	1.80	465	1.49	338	1.50	312
4.....	2.80	875	2.30	670	2.08	580	1.75	445	1.39	297	1.35	248
5.....	2.85	895	2.25	650	2.14	604	1.74	441	1.40	301	1.22	194
6.....	3.80	1,285	2.20	629	2.15	608	1.65	404	1.38	293	1.25	186
7.....	4.20	1,449	2.15	609	2.08	580	1.70	424	1.34	276	1.22	186
8.....	4.80	1,695	2.05	568	2.28	662	1.75	445	1.34	276	1.22	186
9.....	4.60	1,613	2.05	568	2.30	670	1.74	441	1.39	297	1.22	186
10.....	4.20	1,449	2.00	547	2.14	604	1.74	441	1.40	301	1.22	186
11.....	4.00	1,367	2.02	555	2.10	588	1.73	436	1.45	322	1.21	186
12.....	3.80	1,285	2.05	568	2.05	568	1.70	424	1.45	322	1.20	186
13.....	3.80	1,285	1.05	527	2.04	564	1.70	424	1.40	301	1.21	186
14.....	3.75	1,264	1.90	506	2.00	547	1.70	424	1.39	297	1.20	186
15.....	3.70	1,244	1.88	498	1.95	527	1.70	424	1.30	260	1.20	186
16.....	3.50	1,162	1.88	498	1.95	527	1.66	408	1.34	276	1.19	186
17.....	3.50	1,162	3.35	1,101	1.94	522	1.68	416	1.40	301	1.12	180
18.....	3.25	1,060	2.95	527	1.90	506	1.66	408	1.39	297	1.10	170
19.....	3.30	1,080	2.35	691	1.88	498	1.65	404	1.40	301	1.30	184
20.....	3.00	957	2.60	793	1.84	481	1.65	404	1.35	281	1.35	184
21.....	3.00	957	2.20	629	1.84	481	1.50	342	1.32	268	1.38	184
22.....	3.00	957	2.20	629	1.95	527	1.55	362	1.30	256	1.49	182
23.....	3.15	1,019	2.00	547	1.95	527	1.56	367	1.30	252	1.58	180
24.....	3.00	1,367	2.15	609	1.90	506	1.46	326	1.30	250	1.47	182
25.....	4.50	1,572	3.00	957	1.90	506	1.54	358	1.20	208	1.58	180
26.....	3.00	957	2.50	752	1.86	490	1.50	342	1.14	180	1.60	178
27.....	2.95	937	2.35	682	1.85	486	1.44	317	1.25	228	1.55	181
28.....	2.70	834	2.50	752	1.83	477	1.44	317	1.30	240	1.60	178
29.....	2.55	773	2.35	691	1.76	449	1.44	317	1.35	260	1.60	178
30.....	2.45	732	2.35	691	1.85	486	1.35	281	1.35	256	1.60	178
31.....	2.30	670	2.32	678	.....	.....	1.34	277	.....	.....	1.70	176

①]Shifting conditions Nov. 21 to Dec. 5.

②]Ice conditions Dec. 5 to Dec. 31.

## MONTHLY DISCHARGE of Ghost River at Gillies' Ranch, for 1912.

(Drainage area, 367 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	144	100	128	0.35	0.40	7,841
February.....	112	96	99	0.27	0.29	5,721
March.....	137	96	115	0.32	0.37	7,098
April.....	342	76	134	0.36	0.40	7,950
May.....	748	133	358	0.98	1.13	22,005
June.....	1,371	96	300	0.82	0.92	17,826
July.....	1,695	219	1,073	2.92	3.37	65,976
August.....	1,101	498	653	1.78	2.05	40,151
September.....	670	449	545	1.48	1.65	32,430
October.....	486	277	395	1.07	1.23	24,288
November.....	338	180	278	0.757	0.845	16,542
December.....	294	176	196	0.534	0.615	12,052
The year...	.....	.....	.....	.....	13.270	259,880

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## JUMPING POUND CREEK NEAR JUMPING POUND.

This station was established in 1906, by J. F. Hamilton. It is located at a traffic bridge on a road diversion on the S.E.  $\frac{1}{4}$  Sec. 30, Tp. 24, Rge. 4, West 5th Mer., and about 300 yards from Jumping Pound P. O.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to the downstream face of the first pile bent west of the main truss of the bridge. The zero (elev. 89.84) is referred to a permanent iron bench mark (assumed elev. 100.00) situated about 30 feet northeast of the east end of the bridge.

The channel is straight for about 600 feet above and 500 feet below the station. The current is sluggish at, and above the station, but breaks into rapids about 150 feet below the station.

The right bank is composed of gravel and boulders, covered with clay, and is not liable to overflow. The left bank is similar, but not so high, and liable to overflow in excessive floods. The bed of the stream is composed of coarse gravel and boulders. It is rough and may shift in flood stages. The stream is divided into several channels during its higher stages by a pier and pile bents supporting the bridge.

At low stages of the stream discharge measurements are made at wading sections, either above or below the bridge. During higher stages of the stream, discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the west side of the right abutment. Distances are marked on the railing of the bridge, at every five feet from the initial point.

During 1912, the gauge was read by John Bateman, the postmaster at Jumping Pound.

## DISCHARGE MEASUREMENTS of Jumping Pound Creek near Jumping Pound, in 1912.

Date	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 18	H. C. Ritchie	70 0	189 00	0.42	2 43	80 06
May 17	do	99 5	208 70	0.57	2 40	118 63
May 31	do	97 5	198 00	0.594	2 35	117.59
June 13	do	90 5	176.75	0.24	2 17	43.17
June 28	do	97 5	189 85	0.64	2 37	121.14
July 12	do	110 5	314 75	2 58	3 44	800 92
July 27	do	110 0	285 63	2 50	3 32	715.50
Aug. 9	do	97 5	190 35	0 92	2 42	174.74
Aug. 23	do	94 5	178 00	0.70	2 35	122 80
Sept. 3	H. R. Cram	97 5	196 70	0.78	2 37	152 60
Sept. 27	do	97 5	179 00	0.71	2 36	127 00
Oct. 10	do	96 5	189 00	0.71	2 37	134 00
Oct. 25	H. C. Ritchie	94 0	167 40	0 48	2 30	80 40
Nov. 7	do				2 54	114 30

DAILY GAUGE-HEIGHT AND DISCHARGE of Jumping Pound Creek, near Jumping Pound, for 1912.

DAY.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.82	308.00	2.34	112.60
2.....			2.55	165.00	2.36	121.80
3.....			2.50	140.00	2.40	141.00
4.....			2.76	280.00	2.32	103.80
5.....			2.68	234.00	2.30	95.00
6.....			2.58	182.00	2.27	82.40
7.....			2.55	174.00	2.25	74.00
8.....			2.53	166.00	2.29	90.80
9.....			2.55	177.00	2.28	84.60
10.....			2.43	120.00	2.25	74.00
11.....			2.39	104.00	2.20	56.00
12.....			2.35	89.00	2.18	50.00
13.....			2.35	90.00	2.15	41.00
14.....			2.35	90.50	2.25	74.00
15.....			2.40	115.00	3.35	736.00
16.....			2.41	118.50	3.40	772.00
17.....			2.40	118.00	3.03	512.40
18.....	① 2.43	80.06	2.45	144.00	3.01	498.80
19.....	2.40	70.00	2.55	198.00	2.90	425.00
20.....	2.25	28.00	2.55	200.00	2.80	363.00
21.....	2.25	29.00	2.70	286.00	2.60	248.00
22.....	2.23	25.00	2.59	226.00	2.50	194.00
23.....	2.20	20.00	2.65	262.00	2.48	182.60
24.....	2.20	20.50	2.60	237.00	2.45	167.00
25.....	2.20	21.00	2.55	210.00	2.50	194.00
26.....	2.20	21.50	2.60	238.00	2.45	167.00
27.....	2.18	19.00	2.60	240.00	2.45	167.00
28.....	2.18	19.50	2.45	160.00	2.43	156.60
29.....	2.15	17.00	2.40	138.00	2.40	141.00
30.....	2.64	220.00	2.38	126.00	2.55	220.00
31.....			2.35	117.50		

① Shifting conditions from 18 April to May 31.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Jumping Pound Creek, near Jumping Pound, for 1912.  
*Concluded.*

DAY.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	2 50	194 00	2 75	333 00	2 38	131 40	2 30	95 00	2 30	95 00
2	2 70	304 00	2 70	304 00	2 35	117 00	2 28	86 60	2 30	95 00
3	2 90	425 00	2 65	276 00	2 38	131 40	2 28	86 60	2 30	95 00
4	2 95	458 00	2 60	248 00	2 38	131 40	2 29	90 80	2 30	95 00
5	3 00	492 00	2 55	255 00	2 50	194 00	2 30	95 00	2 30	95 00
6	3 10	560 00	2 60	248 00	2 60	248 00	2 30	95 00	2 30	95 00
7	3 25	684 00	2 50	194 00	2 61	253 60	2 29	90 80	2 30	95 00
8	3 60	916 00	2 45	167 00	2 65	276 00	2 30	95 00	2 30	95 00
9	3 90	1,132 00	2 40	141 00	2 60	248 00	2 29	90 80	2 30	95 00
10	4 25	1,384 00	2 35	117 00	2 60	248 00	2 30	95 00	2 30	95 00
11	4 00	1,204 00	2 45	167 00	2 60	248 00	2 35	117 00	2 30	95 00
12	3 60	916 00	2 55	220 00	2 50	194 00	2 38	131 40	2 30	95 00
13	3 80	1,060 00	2 50	194 00	2 40	141 00	2 40	141 00	2 30	95 00
14	3 60	916 00	2 50	194 00	2 35	117 00	2 38	131 40	2 30	95 00
15	3 40	772 00	2 47	177 80	2 30	95 00	2 37	126 60	2 30	95 00
16	3 30	700 00	2 43	156 60	2 25	74 00	2 36	121 80		
17	3 20	628 00	2 95	458 00	2 40	141 00	2 36	121 80		
18	3 00	492 00	2 90	425 00	2 40	141 00	2 35	117 00		
19	2 80	363 00	2 70	304 00	2 35	117 00	2 35	117 00		
20	3 10	560 00	2 60	248 00	2 30	95 00	2 35	117 00		
21	3 00	492 00	2 55	220 00	2 25	74 00	2 35	117 00		
22	3 00	492 00	2 50	194 00	2 30	95 00	2 34	112 60		
23	3 40	772 00	2 35	117 00	2 30	95 00	2 35	117 00		
24	4 00	1,204 00	2 30	95 00	2 35	117 00	2 35	117 00		
25	4 00	1,204 00	2 56	225 60	2 30	95 00	2 32	103 80		
26	3 80	1,060 00	2 50	194 00	2 36	121 80	2 30	95 00		
27	3 30	700 00	2 65	276 00	2 34	112 60	2 29	90 80		
28	3 15	594 00	2 60	248 00	2 30	95 00	2 28	86 60		
29	3 00	492 00	2 50	194 00	2 31	99 40	2 27	82 40		
30	2 92	438 20	2 45	167 00	2 30	95 00	2 26	78 20		
31	2 80	363 00	2 40	141 00	.....		2 26	78 20		

NOTE.—Gauge was not read after Nov. 15.

## MONTHLY DISCHARGE of Jumping Pound Creek near Jumping Pound, for 1912.

(Drainage area, 187 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.	220	19 0	45 4	0 24	0 116	1,171
May	308	89 0	175 9	0 94	1 084	10,816
June	772	41 0	211 5	1 13	1 261	12,385
July	1,384	194 0	708 1	3 78	4 358	43,539
August	533	95 0	222 6	1 19	1 372	13,685
September	276	74 0	144 7	0 77	0 852	8,611
October	131	78 2	104 6	0 56	0 646	6,429
November (1-15)	950	95 0	95 0	0 51	0 284	2,826
The period.....					9 980	99,662

NOTE.—No gauge readings after Nov. 15.

## BOW RIVER AT CALGARY.

The old station established May 5, 1908, by P. M. Sauder at the Cushing traffic bridge on the S.E.  $\frac{1}{4}$  Sec. 12, Tp. 24, Rge. 1, W. 5th Mer., was not satisfactory, and a new gauging station was therefore established on November 25, 1910, by H. R. Carscallen. It is located at the Langevin traffic bridge, on Fourth Street east, in the N.E.  $\frac{1}{4}$  Sec. 15, Tp. 24, Rge. 1, W. 5th Mer. As the cross-section at the Langevin bridge was affected by some old bridge piers, a plain staff gauge was at first fixed to a breakwater, several hundred feet upstream from the bridge, but on November 14, 1911, a chain gauge was established on Langevin bridge and the observations have been made with it since that date.

This gauge, which is of the standard chain type, is fixed to the floor of the bridge at a point about the centre of the downstream side of the north span. The length of the chain from the bottom of the weight to the marker is 22.28 feet. The zero of the gauge (elevation 82.59 feet) is referred to a permanent iron bench mark (assumed elevation 100.00) situated at the intersection of Second and Third Avenues and about 60 feet west of First Street East. There is a gauge embedded in the cement on the north side of the centre pier (whose zero is 87.20 above the same assumed datum) which is usually used to check the chain gauge.

The river flows in one channel at all stages. It is almost straight for about half a mile above and a quarter of a mile below the station. Both banks are low but are not liable to overflow. The bed of the stream is composed of coarse gravel and may shift in flood stages of the stream.

Discharge measurements are made from the downstream side of the bridge, which is a two span steel structure supported by concrete abutments and pier. The initial point for soundings is the south face of the left abutment.

The gauge, was read daily during 1912; from January 1 to March 12, by Andrew Brown; from March 12 to March 31, by C. R. Shannon; and during the remainder of the year, by A. N. Bailey.

## DISCHARGE MEASUREMENTS of Bow River at Calgary, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
① Jan. 15	N. McL. Sutherland	286	1,004.4	1.23	6.38	1,236.2
① Jan. 30	do	286	862.3	1.35	6.49	1,166.6
① Feb. 10	do	315	964.7	1.25	6.25	1,204.0
① Feb. 23	do	287	807.0	1.24	5.99	999.0
① Mar. 7	do	287	755.2	1.15	5.74	869.4
① Mar. 22	do	287	722.7	1.07	5.62	824.6
May 2	H. C. Ritchie	285.5	950.6	1.84	4.185	1,752.7
May 7	F. R. Burfield	287	1,053.8	2.22	4.41	2,338.5
May 21	do	299	1,329.4	3.34	5.35	4,434.2
June 8	do	291.5	1,142.4	2.56	4.66	2,919.0
June 21	do	321	1,975.0	6.10	7.36	12,047.5
July 9	do	323	2,107.5	6.71	7.78	14,149.0
July 15	do	324	2,063.0	6.61	7.60	13,618.1
July 29	do	313.5	1,713.8	5.18	6.60	8,872.9
Aug. 8	do	306.5	1,450.6	4.45	6.11	6,459.7
Aug. 22	do	313.5	1,596.4	5.36	6.56	8,552.7
Sept. 4	do	303.5	1,298.6	4.31	5.79	5,599.6
Sept. 20	do	300.5	1,235.4	3.84	5.51	4,741.7
Oct. 4	do	294.5	1,056.3	3.04	4.91	3,209.0
Oct. 21	do	292.5	1,025	2.82	4.75	2,806
Oct. 31	do	292	938	2.37	4.46	2,226
Nov. 14	do	287.5	927	2.50	4.39	2,313

① Ice conditions.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Bow River at Calgary, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Fed.</i>	<i>Sec.-ft.</i>	<i>Fed.</i>	<i>Sec.-ft.</i>	<i>Fed.</i>	<i>Sec.-ft.</i>	<i>Fed.</i>	<i>Sec.-ft.</i>	<i>Fed.</i>	<i>Sec.-ft.</i>	<i>Fed.</i>	<i>Sec.-ft.</i>
1.....	5.65	680	6.35	1,090	5.94	974	5.00	1,740	4.40	2,120	5.15	3,805
2.....	5.65	680	6.30	1,070	5.95	980	4.95	1,850	4.18	1,748	5.10	3,680
3.....	5.77	720	6.30	1,080	5.97	992	4.93	1,990	4.10	1,620	4.97	3,358
4.....	5.75	720	6.25	1,080	5.98	998	4.95	2,160	4.30	1,950	4.97	3,358
5.....	6.06	880	6.15	1,060	5.97	992	4.80	2,170	4.32	1,984	4.95	3,310
6.....	5.76	720	6.15	1,070	5.95	980	4.40	2,120	4.32	1,984	4.73	2,796
7.....	6.25	1,000	6.20	1,110	5.71	855	4.20	1,780	4.31	1,967	4.55	2,420
8.....	5.95	830	6.25	1,160	5.68	840	4.10	1,620	4.40	2,120	4.75	2,840
9.....	6.25	1,000	6.23	1,160	5.65	825	4.40	2,120	4.42	2,160	5.00	3,430
10.....	6.21	980	6.20	1,160	5.85	925	4.27	1,899	4.39	2,103	5.52	4,780
11.....	6.05	870	6.15	1,100	5.90	950	4.15	1,700	4.38	2,086	5.52	4,780
12.....	6.07	900	6.13	1,088	5.90	950	4.05	1,540	4.43	2,180	5.72	5,392
13.....	6.35	1,070	6.12	1,082	5.68	840	4.03	1,508	4.42	2,160	5.98	6,258
14.....	6.35	1,070	6.12	1,082	5.90	950	4.03	1,508	4.53	2,380	6.42	7,962
15.....	6.31	1,197	6.10	1,070	5.80	900	4.05	1,540	5.03	3,505	6.99	10,474
16.....	6.50	1,330	6.10	1,070	5.75	875	4.30	1,950	5.37	4,362	7.45	12,625
17.....	6.95	1,670	6.05	1,040	5.80	900	4.23	1,831	5.63	5,113	7.72	13,894
18.....	6.65	1,410	6.05	1,040	5.40	710	4.15	1,700	5.55	4,870	7.70	13,800
19.....	6.65	1,410	6.03	1,028	5.75	875	4.08	1,588	5.53	4,810	7.62	13,424
20.....	6.11	1,040	5.92	962	5.75	875	3.92	1,332	5.45	4,580	7.50	12,860
21.....	6.37	1,210	5.92	962	5.80	900	3.81	1,183	5.33	4,258	7.38	12,296
22.....	6.65	1,370	5.93	968	5.65	825	3.70	1,040	5.33	4,258	7.35	12,155
23.....	6.65	1,370	5.94	974	5.45	850	3.72	1,066	5.30	4,180	7.26	11,732
24.....	6.60	1,310	5.94	974	5.69	1,110	3.75	1,105	5.27	4,105	7.20	11,450
25.....	6.65	1,350	5.95	980	5.69	1,240	3.75	1,105	5.25	4,055	7.13	11,121
26.....	6.65	1,320	5.95	980	5.50	1,250	3.77	1,131	5.43	4,524	7.07	10,842
27.....	6.65	1,320	5.97	992	5.50	1,400	3.75	1,105	5.75	5,485	7.00	10,520
28.....	6.65	1,300	5.97	992	5.40	1,450	3.77	1,131	5.75	5,485	7.02	10,612
29.....	6.65	1,300	5.95	980	5.25	1,490	3.93	1,348	5.63	5,113	6.95	10,290
30.....	6.65	1,270	.....	.....	5.25	1,640	3.87	1,261	5.53	4,810	6.73	9,295
31.....	6.35	1,080	.....	.....	5.00	1,590	.....	.....	5.35	4,310	.....	.....

NOTES:—Ice conditions from Jan. 1 to Apr. 6.  
From Jan. 1 to Jan. 14 extremely cold.



DAILY GAUGE-HEIGHT AND DISCHARGE of Bow River at Calgary, for 1912.—*Concluded*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	6 51	8,333	6 38	7,800	6 22	7,160	5 00	3,430	4 45	2,220	4 01	1,420
2.	6 23	7,200	6 34	7,640	6 13	6,814	5 00	3,430	4 60	2,520	4 03	1,400
3.	6 40	7,880	6 37	7,760	5 93	6,078	4 99	3,406	4 62	2,562	3 96	1,230
4.	6 23	7,200	6 35	7,680	5 61	5,051	4 98	3,382	4 62	2,562	4 30	1,720
5.	6 15	6,890	6 37	7,760	5 47	4,636	4 97	3,358	4 60	2,520	4 28	1,640
6.	6 21	7,120	6 30	7,480	5 58	4,960	4 95	3,310	4 55	2,420	4 16	1,400
7.	6 77	9,475	6 26	7,320	5 69	5,299	4 94	3,286	4 48	2,280	4 14	1,300
8.	7 19	11,403	6 19	7,042	5 77	5,547	4 97	3,358	4 45	2,220	4 18	1,320
9.	7 77	14,129	6 12	6,776	5 74	5,454	4 99	3,406	4 53	2,380	4 16	1,230
10.	8 00	15,210	6 02	6,404	5 68	5,268	5 03	3,505	4 50	2,320	4 10	1,120
11.	7 72	13,894	6 08	6,626	5 73	5,423	5 01	3,455	4 45	2,220	3 95	900
12.	7 67	13,659	6 13	6,814	5 81	5,673	4 99	3,406	4 43	2,180	3 64	580
13.	7 49	12,813	6 13	6,814	5 69	5,299	4 96	3,334	4 40	2,120	3 78	670
14.	7 93	14,881	5 95	6,150	5 60	5 020	4 93	3,262	4 41	2,140	3 98	820
15.	7 70	13,800	5 91	6,006	5 58	4,960	4 84	3,046	4 29	1,933	3 95	760
16.	7 45	12,625	6 30	7,480	5 55	4,870	4 83	3,022	4 21	1,797	4 07	840
17.	7 25	11,685	5 29	7,440	5 49	4,692	4 80	2,950	4 25	1,865	4 14	880
18.	6 90	10,080	6 57	8,591	5 48	4,664	4 82	2,998	4 29	1,933	4 09	800
19.	6 70	9,160	6 73	9,295	5 46	4,608	4 84	3,046	4 45	2,220	4 30	980
20.	6 83	9,745	6 70	9,160	5 38	4,358	4 86	3,094	4 40	2,120	4 21	850
21.	6 67	9,028	6 68	9,072	5 30	4,180	4 83	3,022	4 38	2,086	4 33	940
22.	6 50	8,290	6 67	9,028	5 31	4,206	4 80	2,950	4 35	2,035	4 34	920
23.	7 15	11,215	6 65	8,940	5 33	4,258	4 65	2,625	4 30	1,950	4 33	860
24.	7 88	14,646	6 60	8,720	5 31	4,206	4 68	2,688	4 33	2,001	4 32	810
25.	7 92	14,834	6 92	10,152	5 27	4,105	4 70	2,730	4 36	2,052	4 29	760
26.	7 45	12,625	7 13	11,121	5 24	4,030	4 69	2,709	4 29	1,933	4 23	680
27.	7 05	10,750	7 06	10,796	5 20	3,930	4 65	2,625	3 88	1,274	4 16	580
28.	6 91	10,106	7 03	10,658	5 13	3,755	4 67	2,667	3 93	1,348	4 38	760
29.	6 62	8,808	6 72	9,250	5 06	3,580	4 70	2,730	4 05	1,540	4 42	760
30.	6 33	8,419	6 73	9,295	4 95	3,310	4 60	2,520	4 04	1,524	4 45	750
31.	6 44	8,044	6 47	8,167			4 46	2,240			4 61	870

## MONTHLY DISCHARGE of Bow River at Calgary, for 1912.

(Drainage area, 3138 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	1,670	680	1,109	0 35	0 40	68,189
February.	1,160	980	1,048	0 33	0 36	60,284
March. . .	1,640	825	1,030	0 33	0 38	63,330
April . . .	2,170	1,040	1,571	0 50	0 56	93,480
May. . . .	5,485	1,620	3,432	1 09	1 26	211,024
June. . . .	13,894	2,420	8,185	2 61	2 91	487,040
July. . . .	15,210	6,890	10,772	3 43	3 96	662,400
August	11,121	6,006	8,169	2 60	3 00	502,290
September.	7,160	3,310	4,847	1 54	1 72	288,420
October.	3,505	2,240	3,064	0 98	1 12	188,400
November.	2,562	1,274	2,076	0 66	0 74	123,580
December.	1,720	580	985	0 31	0 36	60,565
The year. .					16 77	2,809,012

## ELBOW RIVER AT CALGARY.

This station was established May 8, 1908, by P. M. Sauder. It is located at the traffic bridge between Eleventh and Twelfth Avenues East, in the S.W.  $\frac{1}{4}$  Sec. 14, Tp. 24, Rge. 1, W. 5th. Mer.

The gauge, which is of the standard chain type, is fixed to the sidewalk on the upstream side of the bridge. The zero (elev. 84.75) is referred to a bench mark (assumed elev. 100.00) on the extreme upstream corner of the cement wing wall of the left abutment of the bridge. The length of the chain from the bottom of the weight to the marker is 16.03 feet.

The stream is confined to one channel. Both banks are high and do not overflow. The bed of the stream is composed of boulders and gravel and is not liable to change at the station, but may do so further up the stream where there is a small ripple. The channel is straight for about 500 feet below and 50 feet above the station. The current is swift at all stages of the stream. This station is so close to the mouth of the river that there will be backwater at the gauge when Bow River is in flood.

Discharge measurements are made by means of a cable car, tagged wire, and staywire. The initial point for soundings is the zero of the tagged wire, at its fastening to the cable support, on the left bank.

During 1912, the gauge was read once each day by Mrs. I. S. White.

There are no tributaries below this station and there is no water diverted from the river except that used by the City of Calgary, whose intake is about eleven miles west of Calgary.

## DISCHARGE MEASUREMENTS of Elbow River at Calgary, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 12	N. McL. Sutherland	125	180 75	0 51	1 96	92 3
Jan. 29	do	120	209 01	0 66	2 04	138 98
Feb. 12	do	118	194 7	0 66	2 00	129 4
Feb. 24	do	120	197 6	0 59	1 95	116 13
Mar. 8	do	105	171 2	0 51	1 84	88 0
Mar. 23	do	104	192 1	0 56	1 865	107 5
Apr. 4	do	130	316 5	1 14	2 40	361 47
May 2	H. C. Ritchie	136	347 8	1 38	2 47	481 14
May 6	F. R. Burfield	134	312 35	1 17	2 28	365 99
May 20	do	138 5	356 4	1 48	2 52	527 83
June 11	do	133	303 25	1 11	2 22	357 64
June 24	do	139	421 8	2 09	2 84	881 4
July 8	do	147	602 5	3 70	4 15	2,227 41
July 16	do	146	547 6	3 16	3 76	1,721 83
July 26	H. O. Brown	149	651 4	3 79	4 305	2,470 59
July 31	F. R. Burfield	143	435 4	2 23	3 00	972 72
Aug. 10	do	137	353 35	1 60	2 51	564 86
Aug. 24	do	143	334 2	1 44	2 35	480 41
Sept. 7	do	136	320 15	1 32	2 32	421 32
Sept. 24	do	137	320 4	1 25	2 32	400 30
Oct. 7	do	135 5	286 57	1 05	2 16	300 18
Oct. 22	do	135	298 0	1 10	2 13	326 00
Nov. 2	do	133 5	295 0	0 98	2 10	290 50
Nov. 15	do	129	251 0	0 72	1 91	180 40
Dec. 16	do	127	208 4	0 59	1 97	123 00

## DAILY GAUGE-HEIGHT AND DISCHARGE of Elbow River at Calgary, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1.99	126	2.01	132	1.94	113	2.28	305	2.70	540	2.31	412
2	1.95	116	2.00	129	1.76	67	2.33	330	③ 2.47	480	2.26	377
3	1.69	51	2.10	155	1.95	116	2.46	370	2.44	460	2.17	317
4	1.62	34	① 2.46	150	1.75	65	2.38	365	2.41	440	2.19	329
5	1.66	43	2.03	137	1.84	87	2.64	300	2.38	420	2.15	305
6	1.75	65	1.97	121	1.92	108	2.05	190	2.20	335	2.14	299
7	1.72	58	1.96	119	1.83	85	2.03	180	2.25	370	2.14	299
8	1.68	48	1.97	121	1.86	93	2.13	230	2.29	398	2.15	305
9	1.74	53	1.96	119	1.94	113	2.15	245	2.34	433	2.14	299
10	1.79	75	1.98	124	1.95	116	2.19	265	2.25	370	2.14	299
11	1.88	98	1.98	124	1.95	116	2.14	245	2.20	335	2.21	342
12	1.96	119	1.97	121	1.95	116	2.01	185	2.11	281	2.21	342
13	1.96	119	1.97	121	1.97	121	2.04	205	2.06	255	2.17	317
14	1.96	119	1.97	121	1.93	111	2.05	210	2.16	311	2.46	520
15	1.99	126	① 2.25	120	1.94	113	2.40	400	2.20	335	3.26	1,207
16	2.02	134	1.96	119	1.99	126	2.37	390	2.47	528	5.36	4,312
17	1.99	126	1.96	119	2.16	171	2.35	375	2.50	550	4.88	3,460
18	2.00	129	① 2.73	121	2.03	137	2.30	350	2.50	550	4.56	2,918
19	2.04	139	1.98	124	1.91	106	2.20	295	2.49	542	4.01	2,024
20	1.99	126	1.93	111	1.91	106	2.09	230	2.49	542	3.59	1,535
21	1.95	116	1.94	113	1.86	93	2.08	225	2.45	512	3.36	1,305
22	1.96	119	1.94	113	1.86	93	2.06	220	2.49	542	3.10	1,060
23	1.95	116	1.95	116	① 1.95	116	2.05	215	2.54	582	2.94	916
24	1.98	124	1.94	113	1.96	130	2.06	220	2.53	574	2.79	786
25	1.98	124	① 2.42	110	1.96	150	2.05	215	2.44	505	2.72	727
26	2.00	129	1.90	103	1.96	165	2.04	210	2.39	468	2.70	710
27	2.01	132	1.91	106	1.97	175	2.04	210	2.53	574	2.59	622
28	2.01	132	1.91	106	2.00	190	2.01	200	2.55	590	2.51	558
29	2.01	132	1.89	100	2.02	210	2.06	222	2.46	520	2.47	528
30	2.00	129			1.98	205	2.18	287	2.44	505	2.68	694
31	2.00	129			2.29	300			2.36	447		

① Gauge heights were taken at a different time of day. Mean daily discharge is about that given.

② Changing conditions.

## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Elbow River at Calgary, for 1912.—*Concluded.*

DAY	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2 60	630	2 85	838	2 35	440	2 18	323	2 15	① 168	1 88	98
2	2 58	614	2 75	752	2 33	426	2 17	317	2 14	165	1 85	90
3	2 61	638	2 74	744	2 32	419	2 16	311	2 13	163	1 94	113
4	2 76	761	2 64	662	2 36	447	2 15	305	2 13	163	1 96	119
5	2 68	694	2 61	638	2 44	565	2 14	299	2 12	160	1 93	110
6	3 01	979	2 57	606	2 29	398	2 17	317	2 11	158	1 94	113
7	3 36	1 305	2 54	582	2 32	419	2 16	311	2 10	155	1 98	124
8	3 66	1 611	2 54	582	2 40	475	2 16	311	2 11	158	2 06	144
9	4 61	3 008	2 49	542	2 41	482	2 26	377	2 12	160	2 03	136
10	4 46	2 742	2 45	512	2 48	535	2 23	356	2 12	160	2 06	144
11	4 28	2 437	2 57	606	2 34	433	2 20	335	2 11	158	2 03	136
12	4 16	2 245	2 50	550	2 30	405	2 19	329	2 11	158	2 00	129
13	4 20	2 305	2 46	520	2 26	377	2 24	363	2 10	155	1 99	126
14	4 56	2 918	2 41	482	2 27	384	2 25	370	2 12	160	2 01	132
15	4 17	2 260	2 33	426	2 28	391	2 27	384	2 10	155	2 24	191
16	3 75	1 710	2 38	461	2 25	370	2 27	384	2 10	155	1 97	121
17	3 48	1 425	2 54	582	2 25	370	2 30	405	2 07	147	1 82	82
18	3 26	1 207	2 57	606	2 24	363	2 33	426	2 06	144	1 80	77
19	3 10	1 060	2 52	566	2 21	342	2 26	377	2 13	163	1 79	74
20	3 12	1 078	2 46	520	2 20	335	2 23	356	2 05	142	1 81	80
21	3 17	1 123	2 44	505	2 19	329	2 25	370	2 04	139	1 80	77
22	3 04	1 006	2 37	454	2 31	412	2 11	281	2 06	144	2 10	155
23	3 32	1 265	2 33	426	2 33	426	2 15	305	2 05	142	2 06	146
24	4 10	2 155	2 31	412	2 31	412	2 14	239	2 05	142	2 11	158
25	5 01	3 690	2 41	482	2 30	405	2 14	299	2 02	134	2 14	165
26	4 28	2 437	2 45	512	2 29	398	2 16	311	2 02	134	2 09	152
27	3 73	1 688	2 40	475	2 26	377	2 14	299	2 04	139	2 01	132
28	3 32	1 265	2 53	574	2 23	356	2 14	299	2 03	137	1 95	116
29	3 15	1 105	2 58	614	2 21	342	2 12	287	1 99	126	1 91	106
30	3 01	979	2 46	520	2 18	323	2 14	299	1 94	113	1 71	56
31	2 94	916	2 35	440			2 13	293			1 68	48

① Ice conditions after Nov. 1.

## MONTHLY DISCHARGE of Elbow River at Calgary, for 1912.

(Drainage area, 482 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	139.0	34.0	106.3	0 22	0 25	6,536
February	155.0	100.0	120.2	0 25	0 27	6,914
March	300.0	65.0	129.4	0 27	0 31	7,956
April	400.0	180.0	263.0	0 54	0 60	15,650
May	590.0	255.0	461.0	0 96	1 11	28,346
June	4,312.0	299.0	937.0	1 94	2 16	55,755
July	3,690.0	614.0	1,588.9	3 30	3 81	97,202
August	838.0	412.0	554.5	1 15	1 33	34,095
September	535.0	323.0	403.2	0 84	0 93	23,992
October	426.0	281.0	332.2	0 69	0 79	20,426
November	168.0	113.0	149.9	0 31	0 35	8,820
December	191.0	48.0	117.7	0 24	0 28	7,237
The year					12 19	312,929

## NOSE CREEK NEAR CALGARY.

This station was established April 24, 1911, by H. C. Ritchie. It is located at the traffic bridge on the N.W.  $\frac{1}{4}$  Sec. 13, Tp. 24, Rge. 1, W. 5th Mer. The station is about one and one-half miles east of the centre of the city and about one quarter mile above the junction of Nose Creek with Bow River.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to the upstream face of the upper pile of a row near the left bank. The zero (elev. 92.83) is referred to a permanent iron bench mark (assumed elev. 100.00) on the left bank near the end of the bridge.

The channel is straight for about 50 feet above and 150 feet below the station. A small island just below the bridge divides the stream into two channels in low water and causes cross-currents at the bridge. Both banks are high, steep, gravelly and clear of brush. The bed of the stream is composed of coarse gravel.

Discharge measurements are made from the downstream side of the bridge at high stages and at a wading section downstream in low water.

During 1912, the gauge was read once each day by A. N. Bailey.

#### DISCHARGE MEASUREMENTS of Nose Creek near Calgary, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Fl. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 4	H. C. Ritchie	23.5	28.95	1.98	2.04	57.26
May 8	F. R. Burfield	24	25.12	2.16	1.90	54.34
May 27	do	22.1	18.88	0.98	1.60	18.44
June 10	do	20	15.80	0.23	1.40	3.62
June 20	do	30.1	16.51	1.35	1.74	22.23
July 17	do	31.5	38.67	1.23	1.91	47.72
July 30	do	25	26.9	0.81	1.75	21.72
Aug. 9	do	21	15.95	0.64	1.66	10.25
Aug. 23	do	25	26.95	0.58	1.72	15.65
Sept. 7	do	25	31.65	2.12	2.04	66.97
Sept. 21	do	24	24.35	1.30	1.84	31.58
Oct. 5	do	23	23.20	1.11	1.87	25.67
Oct. 19	do	25	29.0	1.65	2.01	47.90
Oct. 30	do	24.5	25.6	1.19	1.92	30.50
Nov. 16	do	23	23.4	0.84	1.81	19.68

NOTE.—These gaugings were made at wading sections below gauge. Width, area, and mean velocity refer to actual gauging section.

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Nose Creek, near Calgary, for 1912.

DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			2.10	69	1.95	45	1.58	15.1	1.70	15.5
2			2.00	53	1.95	45	1.58	14.9	1.74	19.9
3			2.15	77	2.00	53	1.59	15.7	1.78	25
4			2.10	69	2.02	56	1.58	14.6	1.76	22
5			2.00	53	2.02	60	1.58	14.2	1.73	18.8
6			1.90	38	2.03	66	1.57	13.0	1.80	28
7			1.90	38	2.00	65	1.57	12.6	1.83	32
8			1.95	45	1.95	62	1.55	10.7	1.83	32
9			1.97	48	1.82	43	1.52	8.5	1.95	45①
10			1.95	45	1.85	47	1.50	8.0	2.09	65①
11			1.93	42	1.73	32	1.50	7.1	2.00	58①
12			1.85	30	1.70	28	1.52	7.4	1.93	49
13			1.90	38	1.67	25	1.52	7.0	2.13	82
14			1.85	30	1.62	19.7	1.60	10.5	2.20	82①
15			1.80	24	1.58	16.1	1.73	22	2.13	82
16			1.77	20	1.57	15.2	1.95	43①	2.00	60
17			1.75	17.4	1.58	16.1	2.23	75①	1.93	49
18			1.79	22	1.60	17.8	2.05	70	1.90	44
19			1.75	17.4	1.81	42	1.81	30	1.87	39
20			1.73	15.0	1.85	47	1.73	18.8	2.06	70
21			1.73	15.0	1.92	57	1.70	15.5	2.05	68
22			1.70	11.5	1.83	44	1.68	13.9	1.95	52
23			1.70	11.5	1.80	40	1.64	10.9	1.94	50
24			1.68	10.1	1.78	38	1.61	-9.1	1.90	44
25			1.68	10.1	1.78	38	1.60	8.5	2.22	80①
26	2.20	85	1.65	8.3	1.70	28	1.58	7.5	1.92	46
27	2.25	94	1.63	7.6	1.68	26	1.63	10.3	1.84	34
28	2.20	85	1.63	7.6	1.68	25	1.60	8.5	1.82	31
29	2.00	53	1.60	6.5	1.66	23	1.62	9.7	1.80	28
30	2.12	72	1.73	15.0	1.63	20	1.65	11.5	1.75	21
31	2.15	77			1.60	17.0			1.74	19.9

NOTE.—Shifting conditions May 4 to May 8, and May 27 to June 20.

① Bow River backing up to gauge. Discharge estimated.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Nose Creek, near Calgary, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1 72	17 7	2 10	77	1 87	30	1 78	17 4
2.....	1 70	15 5	2 10	77	1 87	29	1 73	13 8
3.....	1 68	13 9	2 12	80	1 86	27	1 70	12 0
4.....	1 66	12 3	2 09	75	1 86	26	1 63	8 7
5.....	1 70	15 5	2 05	68	1 86	25	1 68	11 0
6.....	1 70	15 5	2 02	64	1 85	24	1 74	14 4
7.....	1 69	14 7	2 05	68	1 85	24	1 86	25
8.....	1 68	13 9	2 11	78	1 90	30	1 89	28
9.....	1 67	13 1	2 14	83	1 94	35	1 83	22
10.....	1 67	13 1	2 13	82	1 95	37	1 79	18 2
11.....	1 72	17 7	2 09	75	1 99	43	1 73	13 8
12.....	1 70	15 5	2 03	65	2 01	46	1 75	15 0
13.....	1 70	15 5	2 02	64	2 02	48	1 80	19 0
14.....	1 70	15 5	1 98	57	2 04	51	1 83	22
15.....	1 70	15 5	1 95	52	2 03	52	1 83	22
16.....	1 74	19 9	1 93	49	2 04	51	.....	.....
17.....	1 85	36	1 89	42	2 02	48	.....	.....
18.....	1 90	44	1 86	37	2 04	51	.....	.....
19.....	1 88	40	1 86	37	2 00	44	.....	.....
20.....	1 85	36	1 85	36	1 96	38	.....	.....
21.....	1 75	21	1 85	36	1 93	34	.....	.....
22.....	1 72	17 7	1 86	37	1 90	30	.....	.....
23.....	1 74	19 9	1 88	39	1 85	24	.....	.....
24.....	1 77	24	1 94	48	1 82	21	.....	.....
25.....	1 85	36	1 93	45	1 80	19 0	.....	.....
26.....	1 83	32	1 92	43	1 78	17 4	.....	.....
27.....	1 88	40	1 91	40	1 78	17 4	.....	.....
28.....	1 89	42	1 90	38	1 79	18 2	.....	.....
29.....	2 01	62	1 88	34	1 81	19 9	.....	.....
30.....	2 13	82	1 87	31	1 80	19 0	.....	.....
31.....	2 11	78	.....	.....	1 78	17 4	.....	.....

NOTE.—Shifting conditions Sept. 21 to Oct. 5.

## MONTHLY DISCHARGE of Nose Creek near Calgary, for 1912.

(Drainage area, 294 square miles.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (26-31).....	94	53	77 7	0 264	0 06	925
April.....	77	6 5	29 8	0 101	0 11	1,773
May.....	66	15 2	37 3	0 127	0 15	2,294
June.....	75	7 0	17 5	0 060	0 07	1,041
July.....	82	15 5	44 9	0 153	0 18	2,761
August.....	82	12 3	27 6	0 094	0 11	1,697
September.....	83	31	55 2	0 188	0 21	3,285
October.....	52	17 4	32 1	0 109	0 13	1,974
November (1-15).....	28	8 7	17 5	0 060	0 03	521
The period.....	.....	.....	.....	.....	1 05	16,271

## CANADIAN PACIFIC RAILWAY COMPANY CANAL NEAR CALGARY.

During 1912 this canal was gauged at a station established by B. Russell on July 10, 1911. It is situated at Bridge No. 1, on the road allowance between the N.E.  $\frac{1}{4}$  Sec. 36, Tp. 23, Rge. 1 W. 5th Mer., and the S.E.  $\frac{1}{4}$  Sec. 1, Tp. 24, Rge. 1, W. 5th Mer., and about three miles southeast of Calgary P.O.

The gauge is a plain staff graduated to feet and hundredths, nailed to the downstream face of one of the piles of the bridge near the right bank. The zero (elev. 88.30 feet) is referred to a bench mark on an iron rod (assumed elev. 100.00) situated just below the left end of the bridge.

The channel is straight for 800 feet above and below the station. The right bank is artificial, clean and high, the left is natural and lower; the bed is sandy and clean, the current sluggish.

Discharge measurements are made from the downstream side of the bridge with meter and weights. Check measurements are also made at Bridge No. 3.

The gauge height observations for 1912 were supplied by the Canadian Pacific Railway Company, A. Hatcher taking the reading once each day for the Company.

## DISCHARGE MEASUREMENTS of C.P.R. Main Canal "A," at Bridge No. 1, in 1912.

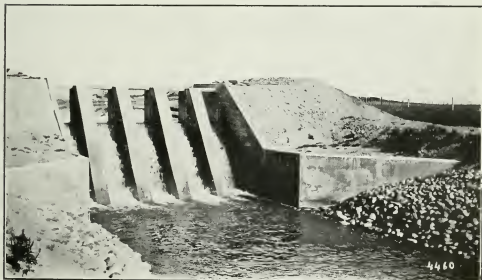
Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 4	H. C. Ritchie	49.5	79.5	1.03	2.06	81.85
May 8	F. R. Burfield	47.5	68.3	0.90	1.82	61.42
May 25	do	55.5	118.2	1.25	2.61	148.39
June 10	do	56.5	118.3	1.54	2.75	181.84
June 20	do	57.0	120.2	1.54	2.85	185.87
July 10	do	58.5	142.4	1.51	2.85	214.50
July 17	do	55.0	118.4	1.52	2.75	180.01
July 30	do	55.0	114.2	1.42	2.64	161.81
Aug. 9	do	54.5	113.2	1.47	2.66	166.02
Aug. 23	do	59.5	167.4	1.91	3.66	320.23
Sept. 7	do	53.5	106.4	1.33	2.50	141.16
Sept. 21	do	59.0	163.5	1.80	3.54	293.26
Oct. 5	do				1.10	Nil.

## DISCHARGE MEASUREMENTS of C.P.R. Main Canal "A," at Bridge No. 3, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 4	H. C. Ritchie	48.0	63.9	1.52	.....	97.19
May 8	F. R. Burfield	42.5	42.3	0.96	.....	39.76
May 25	do	50.0	92.8	1.82	.....	168.60
June 10	do	52.5	96.8	2.03	.....	196.88
June 20	do	52.3	102.4	2.03	2.97	208.26
July 10	do	53.0	121.9	1.91	3.02	233.35
July 17	do	53.5	101.7	1.94	2.85	197.59
July 30	do	53.0	95.8	1.89	2.75	171.26
Aug. 9	do	52.5	97.1	1.75	2.84	169.61
Aug. 23	do	56.9	150.9	2.22	3.77	335.59
Sept. 7	do	51.5	93.1	1.68	2.75	156.53
Sept. 21	do	55.5	142.0	2.05	3.58	291.51



Headgates at North End of Chestermere Lake, on Canadian Pacific Railway Company's Canal.  
Taken by H. R. Carscallen.



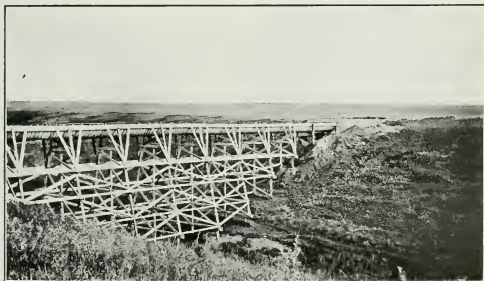
Combined Drop and Regulator on Canadian Pacific Railway Company's Canal in Keoma District.  
Taken by H. R. Carscallen.







Concrete Drop on Canadian Pacific Railway Company's Canal "C."  
Taken by H. R. Carscallen.



Metal Flume used by the Canadian Pacific Railway Company  
to carry lateral ditches across small coulees. Taken by H. R. Carscallen.



## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE OF C.P.R. Main Canal "A," near Calgary, for 1912.

DAY.	April.		May.		June.		July.		August.		September.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.			3 20	247	2 65	167	3 10	232	2 50	146	2 40	132
2.			2 40	132	2 60	160	3 00	217	2 50	146	2 50	146
3.			2 40	132	2 65	167	2 90	202	2 50	146	2 50	146
4.			2 30	118	3 00	217	2 90	202	2 50	146	2 50	146
5.			1 90	71	3 00	217	3 00	217	2 60	160	2 50	146
6.			1 90	71	2 90	202	2 90	202	2 60	160	2 50	146
7.			1 70	51	2 90	202	2 90	202	2 60	160	2 50	146
8.			2 10	94	2 80	188	3 00	217	2 50	146	2 50	146
9.			2 10	94	2 90	202	2 90	202	2 50	146	2 50	146
10.			2 30	118	2 70	174	2 80	188	2 60	160	2 70	174
11.			2 30	118	3 15	240	2 70	174	3 00	217	3 30	262
12.			2 40	132	3 20	247	2 70	174	3 00	217	4 00	368
13.			2 40	132	3 20	247	2 70	174	3 00	217	3 00	217
14.			2 50	146	3 40	277	2 70	174	3 00	217	2 80	188
15.			2 70	174	3 20	247	2 70	174	3 00	217	2 90	202
16.			2 70	174	3 10	232	2 70	174	3 30	262	2 90	202
17.			2 70	174	2 70	174	2 70	174	3 30	262	3 00	217
18.			2 50	146	2 70	174	2 75	181	3 30	262	3 30	262
19.			2 50	146	2 70	174	2 70	174	3 30	262	3 50	292
20.			2 40	132	2 60	160	2 75	181	3 30	262	3 50	292
21.			2 40	132	2 60	160	2 50	146	3 10	232	3 50	292
22.			2 50	146	2 80	188	2 50	146	3 10	232	3 50	292
23.			2 50	146	3 10	232	2 50	146	3 30	262	3 50	292
24.	2 00 ①	82	2 50	146	3 70	322	2 50	146	3 10	232	3 30	262
25.	1 80	61	2 50	146	4 00	368	2 80	188	3 10	232	3 20	247
26.	2 50	146	2 50	146	4 10	384	2 70	174	2 90	202	3 10	232
27.	2 50	146	2 60	160	4 10	384	2 60	160	2 80	188	3 10	232
28.	3 00	217	2 65	167	3 60	307	2 60	160	2 10	94	1 85 ①	66
29.	3 00	217	2 65	167	3 10	232	2 50	146	2 10	94		
30.	3 00	217	2 60	160	3 10	232	2 50	146	2 10	94		
31.			2 65	167			2 60	160	2 10	94		

① Headgates opened.

② Headgates closed.

## MONTHLY DISCHARGE of C.P.R. Main Canal "A" near Calgary, for 1912.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (23-30).....	217	61	140			2,225
May.....	247	51	138			8,485
June.....	384	160	229			13,626
July.....	232	146	179			11,006
August.....	262	94	189			11,621
September (1-28).....	368	66	210			11,662
The period...						58,625

## FISH CREEK NEAR PRIDDIS.

This station was established May 13, 1907, by P. M. Sauder. It is on the S.W.  $\frac{1}{4}$  Sec. 26, Tp. 22, Rge. 3, W. 5th Mer., about one mile from Priddis, and near Percival's buildings.

A plain staff gauge, graduated to feet and hundredths, is placed vertically at the left bank, about 200 yards north of Mr. Percival's house. The zero of the gauge (elev. 90.81) is referred to a permanent iron bench mark (assumed elev. 100.00) situated 36 feet west and a little south of the gauge.

The channel is straight for 300 feet above and 150 feet below the station. The left bank is high, and will not overflow. The right bank is low, covered with bush and timber, and is liable to overflow in extreme high water. The bed is composed of gravel, but is not liable to shift. The current is sluggish in extreme low stages of the stream.

Measurements during low stages of the stream are made by wading at or near the gauge. High water discharges are computed from slope measurements by the use of Kutter's formula, or by gaugings made from the traffic bridge, about a mile upstream near Priddis post office.

During 1912, the gauge was read by Fred Percival.

#### DISCHARGE MEASUREMENTS of Fish Creek, near Priddis, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 10 . . . . .	F. R. Burfield	41 9	53.2	1.51	1.64	80.40
May 29 . . . . .	do	41 0	46.5	0.88	1.50	40.69
June 27 . . . . .	do	38.5	42.5	0.86	1.36	36.65
July 21 . . . . .	do	53 5	97.5	2.62	2.58	255.85
Aug. 14 . . . . .	do	41 5	55.2	1.22	1.70	67.65
Sept. 11 . . . . .	do	41 5	56.7	1.23	1.74	69.81
Oct. 11 . . . . .	do	43 0	62.9	1.31	1.825	82.39
Nov. 6 . . . . .	do	41 0	47.6	0.93	1.51	44.20

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Fish Creek, near Priddis, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1 . . . . .	5 00	①	2 45	170	1 46	37	1 70	58
2 . . . . .	4 96		2 10	109	1 46	37	1 82	71
3 . . . . .	4 50		2 30	142	1 45	36	2 00	95
4 . . . . .	4 50		2 40	160	1 40	33	1 25	24
5 . . . . .	4 47		2 40	160	1 41	34	1 25	24
6 . . . . .	4 46		2 15	117	1 41	34	2 10	109
7 . . . . .	4 46		1 90	81	1 39	32	3 10	312
8 . . . . .	4 00		1 80	69	1 25	24	3 80	500
9 . . . . .	3 98		1 80	69	1 24	23	3 50	415
10 . . . . .	3 80		1 70	58	1 20	21	3 90	530
11 . . . . .	3 49		1 64	52	1 19	20	2 90	264
12 . . . . .	3 46		1 60	48	1 15	18	3 20	336
13 . . . . .	3 40		1 55	44	1 14	18	3 34	372
14 . . . . .	3 40		1 55	44	1 14	18	3 70	471
15 . . . . .	3 90		1 45	36	2 15	117	3 00	288
16 . . . . .	4 00		1 41	34	3 10	312	2 70	220
17 . . . . .	3 49		1 39	32	2 70	220	2 70	220
18 . . . . .	3 48		1 40	33	2 25	153	2 44	168
19 . . . . .	3 90		1 50	40	1 90	81	2 20	125
20 . . . . .	2 35		1 72	60	1 90	81	2 40	160
21 . . . . .	2 00		2 00	95	1 70	58	2 65	210
22 . . . . .	1 50	40	2 24	131	1 59	47	2 55	190
23 . . . . .	1 50	40	1 90	81	1 45	36	2 58	196
24 . . . . .	1 45	36	2 00	95	1 44	35	2 66	212
25 . . . . .	1 45	36	1 90	81	1 43	35	4 50	734
26 . . . . .	1 43	35	1 65	53	1 43	35	3 95	546
27 . . . . .	1 35	30	1 65	53	1 40	33	3 00	288
28 . . . . .	1 35	30	1 60	48	1 35	30	2 55	190
29 . . . . .	1 35	30	1 60	48	1 31	28	2 35	151
30 . . . . .	1 60	48	1 60	48	1 46	37	2 30	142
31 . . . . .			1 65	53			2 15	117

① Ice conditions from April 1st to April 21st. Not sufficient data to compute daily discharges during this period.



Southern Alberta Land Company's Dam in Bow River near Namaka, Alberta.  
Taken by W. G. Bligh.



"Big Cut" on Southern Alberta Land Company's Canal near Gleichen, Alberta.  
Taken by P. M. Sauder.



SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Fish Creek, near Priddis, for 1912.—*Concluded.*

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2 15	117	1 81	70	1 55	44	1 45	36
2.....	2 10	109	1 81	70	1 48	38	1 47	38
3.....	2 10	109	1 74	62	1 46	37	1 45	36
4.....	2 10	109	1 62	50	1 45	36	1 45	36
5.....	2 50	180	1 55	44	1 47	38	1 45	36
6.....	2 45	170	1 80	69	1 46	37	1 31	28
7.....	2 10	109	1 71	59	1 45	36	1 36	31
8.....	1 99	94	2 00	95	1 47	38	1 36	31
9.....	1 75	63	2 20	125	1 53	42	1 35	30
10.....	1 73	61	2 10	109	1 80	69	1 35	30
11.....	1 75	63	2 00	95	1 90	81	1 45	36
12.....	1 89	80	2 00	95	1 90	81	1 45	36
13.....	1 85	75	1 81	70	1 91	82	1 45	36
14.....	1 80	69	1 55	44	1 95	88	1 47	38
15.....	1 80	69	1 50	40	1 95	88	1 45	36
16.....	1 85	75	1 45	36	1 96	89	.....	.....
17.....	1 76	64	1 40	33	1 90	81	.....	.....
18.....	1 70	58	1 40	33	1 90	81	.....	.....
19.....	1 70	58	1 43	35	1 85	75	.....	.....
20.....	1 69	57	1 42	34	1 73	61	.....	.....
21.....	1 55	44	1 40	33	1 71	59	.....	.....
22.....	1 50	40	1 43	35	1 70	58	.....	.....
23.....	1 45	36	1 70	58	1 67	55	.....	.....
24.....	1 45	36	2 00	95	1 67	55	.....	.....
25.....	1 50	40	1 90	81	1 55	44	.....	.....
26.....	1 50	40	1 85	75	1 55	44	.....	.....
27.....	1 80	69	1 80	69	1 30	27	.....	.....
28.....	1 65	53	1 76	64	1 30	27	.....	.....
29.....	1 80	69	1 64	52	1 25	24	.....	.....
30.....	1 80	69	1 55	44	1 25	24	.....	.....
31.....	1 81	70	.....	.....	1 35	30	.....	.....

## MONTHLY DISCHARGE of Fish Creek, near Priddis, for 1912.

(Drainage area, 109 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (22-30).....	48	30	36 1	0 33	0 110	645
May.....	170	32	75 6	0 69	0 800	4,648
June.....	312	18	56 8	0 52	0 560	3,380
July.....	734	24	249 6	2 29	2 640	15,348
August.....	180	36	76 0	0 70	0 807	4,673
September.....	125	33	62 5	0 57	0 636	3,719
October.....	89	24	53 8	0 49	0 565	3,308
November (1-15).....	38	30	34 3	0 31	0 173	1,022
The period.....	.....	.....	.....	.....	6 291	36,743

## NORTH BRANCH OF SHEEP RIVER NEAR MILLARVILLE.

This station was established May 22, 1908, by P. M. Sauder. It is located on the S.W.  $\frac{1}{4}$  Sec. 12, Tp. 21, Rge. 3, W. 5th Mer., 100 feet from Malcolm T. Millar's house.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the cribwork at the left side of the stream. The zero (elev. 82.67) is referred to a permanent iron bench mark (assumed elev. 100.00), situated 36 feet southwest of the N.E. corner of Sec. 2, Tp. 21, Rge. 3, W. 5th Mer., and about 100 yards west of the gauge.



The channel is straight for about 300 feet above and below the station; the banks are high and clean and not liable to overflow and there will be but one channel at all stages.

During high water discharge measurements are made at the traffic bridge about one mile downstream, on the road allowance on the east boundary of Sec. 12. At low stages the stream is gauged at a wading section about 200 feet downstream from the gauge. The cross-section at the gauge is unsuitable for gauging, as the stream is very deep and sluggish at this point.

During 1912, the gauge was read once daily by Malcolm T. Millar.

#### DISCHARGE MEASUREMENTS of North Branch of Sheep River near Millarville, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 10	F. R. Burfield	67	221 25	0.65	2.95	143.96 ①
May 29	do	59	195 6	0.32	2.90	63.54 ①
June 26	do	66 5	205	0.69	2.97	141.39 ①
July 19	do	74 5	256 7	1.23	3.54	315.21 ①
Aug. 13	do	64 5	205 9	0.51	2.82	104.67 ①
Sept. 10	do	62	187 2	0.24	2.58	45.57 ①
Oct. 11	do	64 5	48 7	1.80	2.77	87.74 ①
Nov. 5	do	45	29 9	1.26	2.40	37.69 ①

① Taken from traffic bridge N.E. 12. 21. 3. 5.

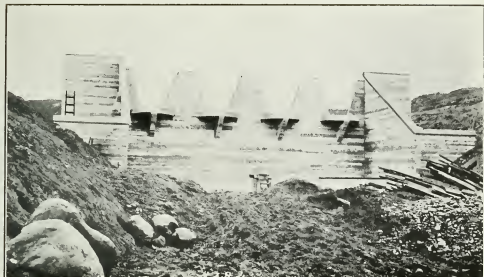
② Taken at wading section below gauge.

#### DAILY GAUGE-HEIGHT AND DISCHARGE of North Branch of Sheep River, near Millarville, for 1912.

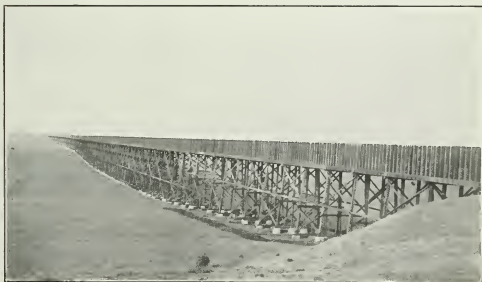
DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			3.04	164	2.91	127	2.77	91	3.03	161
2			2.97	144	2.93	132	2.77	91	3.07	173
3			2.98	146	3.02	153	2.66	67	3.34	254
4			2.93	132	3.07	173	2.57	52	3.12	188
5			2.39	31	3.06	170	2.57	52	3.07	173
6			2.35	28	3.08 ①	176	2.57	52	3.67	353
7			2.39	31	3.16 ①	200	2.57	52	4.27	533
8			2.49	41	3.20 ①	212	2.57	52	5.50	902
9			2.52	45	3.10 ①	182	2.52	45	5.42	878
10			2.55	49	2.95 ②	138	2.52	45	5.42	878
11			3.97	443	3.00	152	2.52	45	4.62	638
12			3.48	296	2.99	149	2.52	45	4.27	533
13			2.99	149	2.99	149	2.52	45	4.20	512
14			2.87	116	2.98	146	2.52	45	4.45	582
15			2.86	113	2.98	146	3.40	272	4.07	473
16			2.82	103	2.97	144	5.47	893	3.94	434
17			2.85	110	2.93	132	4.47	588	3.74	374
18			2.92	129	2.92	130	4.07	473	3.57	323
19			3.02	158	2.95	138	3.67	353	3.47	293
20			2.75	86	2.97	144	3.47	293	3.67	353
21			2.63	61	3.05	167	3.32	248	3.72	368
22			2.55	49	2.97	144	3.27	233	3.47	293
23			2.60	56	3.24	224	3.27	233	3.52	308
24			2.60	56	3.12	188	3.07	173	4.45	582
25			2.60	56	3.07	173	3.47	293	5.10	782
26			2.60	56	3.07	173	2.67	69	4.42	578
27	3.95	①	2.60	56	3.07	173	2.97	144	3.97	443
28	3.36		2.62	60	2.98	146	2.82	103	3.77	383
29	3.32		2.67	69	2.91	127	2.82	103	3.67	353
30	3.43		2.82	103	2.88	118	2.97	144	3.47	293
31	2.99				2.85	110			3.42	276

① Ice conditions during March; not sufficient data to compute discharges.

② Interpolated.



Concrete Notch Drop on Southern Alberta Land Company's Canal.  
Taken by P. M. Sauder.



Wooden Flume on Southern Alberta Land Company's Canal  
over Mile-Wide Valley. Taken by P. M. Sauder.



## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of North Branch of Sheep River, near Millarville, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	3.27	233	2.47	39	2.48	40	2.56	50
2.	3.27	233	2.47	39	2.45	37	2.56	50
3.	3.27	233	2.47	39	2.40	32	2.45	37
4.	3.27	233	2.47	39	2.40	32	2.37	30
5.	3.42	278	2.47	39	2.47	39	2.36	29
6.	3.29	239	2.47	39	2.45	37	2.33	27
7.	3.12	188	2.47	39	2.40	32	2.27	23
8.	3.07	173	2.52	45	2.40	32	2.34	27
9.	3.02	158	2.52	45	2.65	65	2.38	30
10.	2.97	144	2.52	45	2.75	86	2.38	30
11.	2.97	144	2.55	49	2.75	86	2.20	20
12.	2.97	144	2.45	37	2.80	98	2.27	23
13.	2.97	144	2.43	35	2.87	116	2.40	32
14.	2.07	144	2.42	34	2.95	138	2.41	32
15.	2.97	144	2.40	32	2.85	110	2.20	20
16.	2.76	88	2.32	26	2.76	88		
17.	2.74	84	2.35	28	2.76	88		
18.	2.76	88	2.35	28	2.75	86		
19.	2.76	88	2.35	28	2.75	86		
20.	2.67	69	2.35	28	2.68	71		
21.	2.67	69	2.35	28	2.55	49		
22.	2.67	69	2.35	28	2.55	49		
23.	2.67	69	2.68	53	2.53	46		
24.	2.67	69	2.60	56	2.53	46		
25.	2.47	39	2.70	75	2.53	46		
26.	2.47	39	2.70	75	2.53	46		
27.	2.47	39	2.69	73	2.53	46		
28.	2.47	39	2.68	71	2.55	49		
29.	2.47	39	2.55	49	2.42	39		
30.	2.47	39	2.55	49	2.40	32		
31.	2.47	39			2.50	42		

## MONTHLY DISCHARGE of North Branch of Sheep River near Millarville, for 1912.

(Drainage area, 194 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.	443	28	104	0.538	0.60	6,218
May.	224	110	156	0.804	0.93	9,592
June.	893	45	180	0.928	1.04	10,711
July.	902	161	441	2.273	2.62	27,116
August.	278	39	123	0.631	0.73	7,533
September.	75	26	43.0	0.222	0.25	2,559
October.	138	32	60.8	0.313	0.36	3,738
November (1-15).	50	20	30.7	0.158	0.088	913
The period.					6.618	68,380

## SOUTH BRANCH OF SHEEP RIVER NEAR BLACK DIAMOND.

This station was established May 23, 1908, by P. M. Sauder. It is located at the steel high-way bridge on the road allowance between Secs. 8 and 17, Tp. 20, Rge. 2, W. 5th Mer., one half mile from Black Diamond Post Office.

The gauge, which is of the standard chain type, is fastened to the downstream side of the floor of the bridge, about midway between the west abutment and the centre pier. The zero of the gauge (elev. 93.66) is referred to a permanent iron bench mark (assumed elev. 100.00) located in front of the downstream end of the centre pier 75 feet north of the northeast corner of the N.W.  $\frac{1}{4}$  Sec. 8, Tp. 20, Rge. 2, W. 5th Mer.

The channel is straight for about 150 feet above the station, then swings sharply to the left. It is straight for about 500 feet below the station, then turns gradually to the right. Both banks are composed of gravel. The right bank is low, partly covered with brush, and overflows during the higher stages of the stream. The left bank is high and cannot overflow. The bed is composed of coarse gravel, and is permanent in low water stages of the stream, but a gravel bar at the right bank, which is covered during high water stages, is liable to shift. The river has considerable fall and the current is swift.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the outer edge of the bed plate on the west end of the bridge. Distances from the initial point are marked at every five feet on the bottom chord of the bridge.

During 1912, the gauge was read by Herbert Arnold, merchant at Black Diamond.

#### DISCHARGE MEASUREMENTS of South Branch of Sheep River, near Black Diamond, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 9.....	F. R. Burfield.....	76.4	142.08	1.87	1.23	265.71
May 28.....	do.....	79.0	148.10	2.36	1.47	350.04
June 26.....	do.....	80.0	151.70	2.72	1.42	412.99
July 19.....	do.....	80.0	166.00	3.20	1.60	531.02
Aug. 13.....	do.....	77.5	121.75	1.95	1.05	297.18
Sept. 10.....	do.....	75.5	96.30	1.41	0.78	135.93
Oct. 10.....	do.....	75.2	95.06	1.44	0.80	136.78
Nov. 5.....	do.....	70.0	75.6	1.04	0.55	78.54

#### DAILY GAUGE-HEIGHT AND DISCHARGE of South Branch of Sheep River, near Black Diamond, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.18	780	0.85	149	1.20	253	1.40 ①	398
2.....	2.00	640	0.82	141	1.15	237	1.60 ①	526
3.....	1.95	604	0.85	149	1.10	221	1.80	676
4.....	1.77	491	0.90	162	1.10	221	1.75	638
5.....	1.45	343	0.90	162	1.08 ①	215	1.62	540
6.....	1.15	237	0.92	168	1.05 ①	206	1.95	798
7.....	1.00	191	1.10	221	1.05	206	2.00	840
8.....	0.95	176	1.30	287	1.15	237	3.00	1,830
9.....	1.05	206	1.40	324	1.17	243	2.60	1,430
10.....	1.00	191	1.10	221	1.18	247	2.40	1,230
11.....	1.00	191	1.03	200	1.22	260	2.20	1,030
12.....	0.88	157	1.08	215	1.30	287	2.00	840
13.....	0.80	136	1.20	253	1.35	305	2.25	1,080
14.....	1.05	206	1.35	305	1.30	287	2.20	1,030
15.....	1.15	237	1.45	343	1.50 ①	363	2.10	932
16.....	1.12	227	1.58	395	2.98 ①	1,670	1.90	756
17.....	0.98	185	1.58	395	2.98	1,698	1.80	676
18.....	0.92	168	1.35	305	2.60	1,340	1.72	615
19.....	0.90	162	1.34 ①	301	2.30	1,066	1.60	526
20.....	0.88	157	1.32	294	2.10	896	1.70	600
21.....	0.80	136	1.30	287	1.90	740	1.65	562
22.....	0.75	124	1.25	270	1.70	594	1.55	492
23.....	0.85	149	1.40	324	1.60	526	1.55	492
24.....	0.85	149	1.50	363	1.50	460	1.95	798
25.....	0.85	149	1.60	406	1.50	460	2.35	1,180
26.....	0.85	149	1.55	384	1.45	428	2.15	980
27.....	0.78	131	1.63	420	1.40	398	1.90	756
28.....	0.75	124	1.50	363	1.35	369	1.75	638
29.....	0.80	136	1.35	305	1.25	316	1.65	562
30.....	0.90	162	1.30	287	1.20	291	1.60	528
31.....			1.20	253			1.50	460

①Interpolated.

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of South Branch of Sheep River, near Black Diamond, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.45	428	0.80	141	0.80	141	0.62	95
2.....	1.40	398	0.80	141	0.75	127	0.70	114
3.....	1.40	398	0.80	141	0.75	127	0.70	114
4.....	1.50	460	0.80	141	0.75	127	0.55	80
5.....	1.35	369	0.90	172	0.78	135	0.60	91
6.....	1.39①	392	0.80	141	0.70	114	0.60	91
7.....	1.35①	369	0.78	135	0.75	127	0.60	91
8.....	1.25①	316	0.90	172	0.76①	130	0.50	69
9.....	1.20①	291	0.80	141	0.80①	141	0.60	91
10.....	1.10	245	0.78	135	0.82	147	0.60	91
11.....	1.10	245	0.77①	133	0.80	141	0.62	95
12.....	1.10	245	0.75	127	0.80	141	0.62①	95
13.....	1.05	225	0.75	127	0.82①	147	0.62①	95
14.....	1.02	214	0.75	127	0.85	156	0.62①	95
15.....	1.00	206	0.72	119	0.85	156	0.60	91
16.....	1.10	245	0.70	114	0.80	141	.....	.....
17.....	1.02	214	0.72	119	0.80	141	.....	.....
18.....	1.05	225	0.70	114	0.82	147	.....	.....
19.....	1.00	206	0.72	119	0.80	141	.....	.....
20.....	0.98	199	0.70	114	0.78	135	.....	.....
21.....	0.95	189	0.70	114	0.78①	135	.....	.....
22.....	0.92	179	0.80	141	0.78	135	.....	.....
23.....	0.90	172	0.82	147	0.75	127	.....	.....
24.....	0.90	172	0.80	141	0.70	114	.....	.....
25.....	0.92	179	0.80	141	0.65	102	.....	.....
26.....	0.90	172	0.80①	141	0.65	102	.....	.....
27.....	0.90	172	0.80	141	0.65	102	.....	.....
28.....	0.88	166	0.75	127	0.64①	100	.....	.....
29.....	0.85	156	0.75	127	0.62	95	.....	.....
30.....	0.85	156	0.75	127	0.62	95	.....	.....
31.....	0.82	147	.....	.....	0.62	95	.....	.....

① Interpolated.

## MONTHLY DISCHARGE of South Branch of Sheep River, near Black Diamond, for 1912.

(Drainage area, 241 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	780	124	236	0.981	1.09	14,073
May.....	420	141	279	1.158	1.34	17,161
June.....	1698	206	501	2.080	2.32	29,830
July.....	1830	398	788	3.271	3.78	48,471
August.....	460	147	250	1.037	1.20	15,371
September.....	172	114	134	0.556	0.62	7,974
October.....	156	95	128	0.532	0.61	7,870
November (1-15).....	114	80	93	0.387	0.22	2,773
The period.....	.....	.....	.....	.....	11.18	143,523

## SHEEP RIVER NEAR OKOTOKS.

This station was established by J. F. Hamilton in 1906. It is located at the Canadian Pacific Railway bridge about one mile from Okotoks, on the N.W.  $\frac{1}{4}$  Sec. 22, Tp. 20, Rge. 29, W. 4th Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to the cribwork on the left side of the centre pier. There is also a plain staff gauge graduated to feet and tenths imbedded in the cement on the left face of the centre pier near the downstream end for use during

flood stages. The gauges are referred to a bench mark on the top of the left abutment at the southwest corner. This is a Canadian Pacific Railway bench mark and the elevation 3431.57 marked upon it, is used for reference. The elevation of the zero of the staff gauge is 3417.12, whilst that of the high water gauge is 2.00 feet higher.

The channel is straight for 500 feet above and below the station. The current is sluggish at the station, but swift both above and below. The right bank is high and not liable to overflow. The left bank is lower and may overflow in very high stages. Both banks are covered with brush and trees. The bed of the stream is composed of sand and gravel and liable to shift. A number of piles, remnants of the old wooden bridge, still stand in the bed and affect the velocity observations.

Discharge measurements are made from the downstream side of the bridge, except in low water, when wading sections can be obtained.

During 1912, the gauge was read by Miss M. B. Henderson.

#### DISCHARGE MEASUREMENTS of Sheep River, near Okotoks, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 6.....	N. McL. Sutherland.....	98	320.40	.88	2.55	289.67
May 3.....	H. C. Ritchie.....	98	328.20	1.24	2.74	406.72
May 13.....	F. R. Burfield.....	98	337.20	1.04	2.64	349.73
June 1.....	do.....	98	338.00	1.07	2.64	361.29
June 25.....	do.....	98	346.30	1.92	3.03	656.20
July 18.....	do.....	98.5	425.25	2.86	3.53	1,115.65
Aug. 12.....	do.....	98	353.55	1.28	2.70	453.12
Sept. 9.....	do.....	98	332.05	1.06	2.58	353.30
Oct. 9.....	do.....	98	307.25	.86	2.43	264.52
Nov. 4.....	do.....	98	279.50	.40	2.11	110.40

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Sheep River, near Okotoks, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....		①.....	2.74 ①	425	2.64	366	3.00 ①	610
2.....			2.74 ①	425	2.59	337	3.09	683
3.....			2.74	425	2.58	331	3.29	863
4.....			2.74	425	2.56 ①	320	3.24	816
5.....			2.74	425	2.54	309	3.19	771
6.....	2.55	314	2.49	282	2.49	282	3.79	1,444
7.....	2.53 ①	303	2.79	461	2.52 ①	298	4.17	2,040
8.....	2.51 ①	292	2.84	495	2.54	309	5.45	4,711
9.....	2.49	282	2.89	530	2.57	326	5.00 ①	3,692
10.....	2.49	282	2.74	425	2.58 ①	331	4.58	2,821
11.....	2.46 ①	265	2.59	337	2.59	337	4.50	2,660
12.....	2.42 ①	244	2.59	337	2.61	349	4.42 ①	2,504
13.....	2.39	229	2.64	366	2.62 ①	355	4.36 ①	2,388
14.....	2.41	239	2.80 ①	468	2.70 ①	402	4.25	2,184
15.....	2.99	603	2.94	566	3.09	684	4.09	1,901
16.....		①	3.04	642	5.75	5,446	3.80 ①	1,458
17.....			3.09	684	5.20 ①	4,133	3.49	1,069
18.....			2.79	461	4.45	2,562	3.49	1,069
19.....			2.84	495	4.15	2,004	3.49 ①	1,069
20.....			2.84	495	3.72	1,347	3.49	1,069
21.....			2.91 ①	544	3.49	1,069	3.59	1,183
22.....			2.98 ①	593	3.19	771	3.60 ①	1,195
23.....			3.04	642	3.19	771	3.80 ①	1,458
24.....			3.11	701	3.09 ①	684	4.09	1,901
25.....			3.10 ①	692	3.03	634	4.20	2,093
26.....			3.09	683	2.99 ①	603	4.10 ①	1,918
27.....			3.09	683	2.95 ①	573	3.99	1,740
28.....			2.99	603	2.89	530	3.89	1,588
29.....			2.94	566	2.74	425	3.69 ①	1,307
30.....			2.84 ①	495	2.94	566	3.50 ①	1,080
31.....			2.74	425			3.29	863

① Interpolated.

② Ice conditions not sufficient data to compute discharge.

③ No gauge height records.

SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Sheep River, near Okotoks, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.29	863	2.34	205	2.44	255	2.79	461
2.....	3.09	684	2.34	205	2.39	229	2.84	495
3.....	3.09 ①	684	2.34 ①	205	2.29	183	2.45 ①	260
4.....	3.09	684	2.34	205	2.29 ①	183	2.09	104
5.....	3.04	642	2.34 ①	205	2.29	183	2.09 ①	104
6.....	2.99	602	2.34	205	2.32 ①	197	2.09 ①	104
7.....	2.94 ①	566	2.34	205	2.35 ①	210	2.09 ①	104
8.....	2.89	530	2.44	255	2.40 ①	234	2.09	104
9.....	2.79	461	2.44	255	2.43	250	2.09 ①	104
10.....	2.71 ①	409	2.44 ①	255	2.46 ①	265	2.09 ①	104
11.....	2.64	366	2.44 ①	255	2.49	282	2.09 ①	104
12.....	2.62 ①	355	2.44 ①	255	2.54	309	2.09 ①	104
13.....	2.60 ①	343	2.44	255	2.59	337	2.09	104
14.....	2.59	337	2.34	205	2.64	366	2.09	104
15.....	2.59	337	2.34	205	2.60 ①	343	2.47	271
16.....	2.59	337	2.34	205	2.55 ①	314	.....	.....
17.....	2.62 ①	355	2.34 ①	205	2.52 ①	298	.....	.....
18.....	2.49	282	2.34	205	2.49	282	.....	.....
19.....	2.46 ①	265	2.25 ①	166	2.46 ①	265	.....	.....
20.....	2.44	255	2.19	141	2.44	255	.....	.....
21.....	2.44	255	2.19	141	2.44	255	.....	.....
22.....	2.44 ①	255	2.30 ①	188	2.35 ①	210	.....	.....
23.....	2.44 ①	255	2.37 ①	220	2.29	183	.....	.....
24.....	2.44	255	2.44	255	2.29	183	.....	.....
25.....	2.44 ①	255	2.44	255	2.29	183	.....	.....
26.....	2.44 ①	255	2.44 ①	255	2.35 ①	210	.....	.....
27.....	2.44	255	2.44	255	2.40 ①	234	.....	.....
28.....	2.39	229	2.44 ①	255	2.50 ①	287	.....	.....
29.....	2.34	205	2.44 ①	255	2.60 ①	343	.....	.....
30.....	2.34	205	2.44 ①	255	2.70 ①	402	.....	.....
31.....	2.34 ①	205	.....	.....	2.75 ①	435	.....	.....

① Interpolated.

## MONTHLY DISCHARGE of Sheep River, near Okotoks, for 1912.

(Drainage area, 624 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (6-15).....	603	239	305	0.489	0.18	6,050
May.....	701	282	510	0.818	0.94	31,359
June.....	5,446	282	915	1.467	1.64	54,446
July.....	4,711	610	1,682	2.695	3.11	103,420
August.....	863	205	387	0.620	0.72	23,796
September.....	255	141	221	0.354	0.40	13,180
October.....	435	183	263	0.422	0.49	16,171
November (1-15).....	495	104	175	0.281	0.16	5,206
The period.....	5,446	104	.....	.....	7.64	253,598

## HIGHWOOD RIVER AT BROWN'S RANCH.

This station was established on July 27, 1912, by F. R. Burfield. It is located on the S.E.  $\frac{1}{4}$  Sec. 20, Tp. 18, Rge. 2, W. 5th Mer., about eight miles north of Pekisko and five miles west of Longview Post Office.

The gauge, which is a plain staff gauge graduated to feet and hundredths, is nailed to a post driven into the bed of the stream near the right bank. The zero (elev. 91.97) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the right bank, 55 feet west south-west of the gauge.



The channel is straight for 300 feet above and below the gauge. The right bank is low and wooded, and may overflow in flood stages; the left bank is very high and rocky. The bed is of coarse gravel, clean, and shifts during floods. The current is swift.

Discharge measurements are made from the downstream side of the traffic bridge one and a half miles downstream, with meter and weights, where also miscellaneous measurements were made previous to the establishment of the station.

From August 1 to November 15 the gauge was read daily by B. F. Brown.

#### DISCHARGE MEASUREMENTS of Highwood River at Brown's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 16.....	F. R. Burfield.....	183.7	318.0	3.80	.....	1,209.4
June 6.....	do.....	142.3	196.7	2.66	.....	521.7
July 5.....	do.....	171.5	325.7	3.15	.....	1,025.8
July 26.....	do.....	187.2	398.0	3.81	.....	1,517.9
Aug. 20.....	do.....	156.7	211.1	2.28	1.05	481.7
Sept. 18.....	do.....	120.0	141.8	1.90	0.75	269.4
Oct. 17.....	do.....	120.5	139.0	2.04	0.77	283.4
Nov. 12.....	do.....	119.5	111.4	1.75	0.69	195.1

These gaugings were all made at the traffic bridge  $1\frac{1}{2}$  miles below the gauge rod. The width, area, and mean velocity refer to the section at the bridge.

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Highwood River at Brown's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.55	963	0.93	390	0.78	285	0.85	333
2.....	1.52	928	0.91	375	0.78	285	0.87	347
3.....	1.53	940	0.90	368	0.75	265	0.85	333
4.....	1.55	963	0.89	361	0.75	265	0.80	299
5.....	1.35	747	0.87	347	0.75	265	0.75	265
6.....	1.33	727	0.85	333	0.75	265	0.72	245
7.....	1.31	708	0.83	319	0.76	272	0.70	231
8.....	1.15	560	0.80	299	0.78	285	0.68	212
9.....	1.13	544	0.95	404	0.78	285	0.70	221
10.....	1.12	536	0.93	390	0.76	272	0.70	216
11.....	1.18	586	0.81	306	0.78	285	0.69	204
12.....	1.12	536	0.80	299	0.78	285	0.68	192
13.....	1.12	536	0.79	292	0.78	285	0.70	206
14.....	1.15	560	0.79	292	0.76	272	0.75	240
15.....	1.17	577	0.78	285	0.76	272	0.73	226
16.....	1.15	560	0.79	292	0.75	265	.....	.....
17.....	1.19	594	0.78	295	0.77	279	.....	.....
18.....	1.17	577	0.75	265	0.78	285	.....	.....
19.....	1.15	560	0.75	265	0.77	279	.....	.....
20.....	1.03	465	0.75	265	0.76	272	.....	.....
21.....	1.01	450	0.75	265	0.75	265	.....	.....
22.....	0.99	434	0.78	285	0.75	265	.....	.....
23.....	0.97	419	0.85	333	0.75	265	.....	.....
24.....	0.95	404	0.85	333	0.76	272	.....	.....
25.....	0.94	397	0.85	333	0.75	265	.....	.....
26.....	0.92	382	0.83	319	0.75	265	.....	.....
27.....	0.90	368	0.83	319	0.75	265	.....	.....
28.....	0.88	354	0.80	299	0.78	285	.....	.....
29.....	0.90	368	0.78	285	0.80	299	.....	.....
30.....	0.93	390	0.76	272	0.80	299	.....	.....
31.....	0.95	404	.....	.....	0.85	333	.....	.....

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## MONTHLY DISCHARGE of Highwood River at Brown's Ranch, for 1912.

(Drainage area, 470 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
August.....	963	354	565.7	1.204	1.39	34,783
September.....	404	265	315.8	0.672	0.75	18,791
October.....	333	265	277.4	0.590	0.68	17,055
November (1-15).....	347	192	251.3	0.535	0.30	7,477
The period.....					3.12	78,106

## PEKISKO CREEK AT PEKISKO.

This station was established on October 6, 1911, by L. R. Brereton. It is located on the N.W.  $\frac{1}{4}$  Sec. 8, Tp. 17, Rge. 2, W. 5th Mer., about 200 yards from Mr. Geo. Lane's ranche house, and is about twenty-five miles southwest of High River.

The gauge, which is a plain staff, graduated to feet and hundredths, is spiked to a post driven into the bed of the stream at the right bank about ten feet downstream from the bridge. The zero (elev. 93.90) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the left bank 125 feet N. 55° E. from the gauge.

The channel is straight for 200 feet above and 150 feet below the station. Both banks are fairly low, sparsely covered with brush and trees, and liable to overflow in high stages of the stream. The bed is composed of fine gravel.

Discharge measurements are made from a small suspension foot-bridge at high stages and at a wading section near the station in low water. The initial point for soundings is the stream side of the large tree on the left bank to which the end of the bridge is attached.

During 1912 the gauge was read twice daily by Mr. R. W. L. Cowell.

An exceptional rainstorm on the 15th June altered the section at the gauge, considerably increasing the area but reducing the discharge slightly.

## DISCHARGE MEASUREMENTS of Pekisko Creek at Pekisko, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 15.....	F. R. Burfield.....	51.3	85.6	0.87	1.61	75.17
June 5.....	do .....	47.6	74.4	0.66	1.38	49.39
July 5.....	do .....	55.0	167.1	0.45	1.71	75.78
July 26.....	do .....	56.7	194.5	1.09	2.20	211.88
Aug. 20.....	do .....	53.7	146.5	0.24	1.33	34.31
Sept. 18.....	do .....	53.4	140.6	0.12	1.22	16.95
Oct. 16.....	do .....	54.0	148.7	0.20	1.37	29.10
Nov. 12.....	do .....	52.9	139.4	0.11	1.195	15.03

## DAILY GAUGE-HEIGHT AND DISCHARGE of Pekisko Creek at Pekisko, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis. charge.	Gauge Height.	Dis. charge.	Gauge Height.	Dis. charge.	Gauge Height.	Dis. charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.58	70	1.38	45	1.49	57	1.73	78
2.....	1.44	51	1.36	43	1.45	52	1.75	82
3.....	1.50	58	1.40	47	1.42	49	1.72	76
4.....	1.72	96	1.41	48	1.41	48	1.70	72
5.....	1.28	36	1.42	49	1.39	46	1.72	76
6.....	1.58	70	1.42	49	1.37	44	1.71	74
7.....	1.10	24	1.47	54	1.35	42	1.76	84
8.....	1.35	42	1.54	64	1.33	40	2.52	332
9.....	1.37	44	1.56	67	1.31	39	2.38	277
10.....	1.37	44	1.54	64	1.30	38	2.23	222
11.....	1.42	49	1.52	61	1.28	36	2.12	185
12.....	1.37	44	1.51	59	1.25	34	2.02	153
13.....	1.36	43	1.54	64	1.24	33	2.11	181
14.....	1.32	40	1.56	67	1.25	34	2.15	195
15.....	1.41	48	1.58	70	2.77	504	2.02	156
16.....	1.42	49	1.66	84	3.92	926	1.99	144
17.....	1.39	46	1.66	84	3.00	542	1.95	135
18.....	1.37	44	1.58	70	2.58	355	1.92	124
19.....	1.41	48	1.59	71	2.35	266	1.86	109
20.....	1.39	46	1.65	82	2.15	195	1.90	119
21.....	1.35	43	1.64	80	2.04	159	2.02	153
22.....	1.36	43	1.65	82	1.93	127	1.90	119
23.....	1.41	48	1.70	92	1.88	114	1.96	135
24.....	1.43	50	1.71	94	1.82	99	2.09	175
25.....	1.42	49	1.70	92	1.74	80	2.28	240
26.....	1.40	47	1.73	99	1.68	68	2.19	209
27.....	1.41	48	1.69	90	1.64	62	2.10	178
28.....	1.40	47	1.63	78	1.61	57	2.02	153
29.....	1.39	46	1.63	78	1.58	53	1.92	124
30.....	1.41	48	1.60	73	1.82	99	1.87	111
31.....			1.52	61			1.84	104

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Pekisko Creek at Pekisko, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.78	89	1.26	20	1.31	24	1.34	26
2.....	1.73	78	1.25	19.0	1.30	23	1.31	24
3.....	1.85	106	1.25	19.0	1.30	23	1.28	21
4.....	1.94	129	1.25	19.0	1.33	25	1.28	21
5.....	1.80	94	1.25	19.0	1.34	26	1.28	21
6.....	1.72	76	1.25	19.0	1.33	25	1.27	21
7.....	1.66	65	1.25	19.0	1.32	25	1.24	18.2
8.....	1.63	60	1.32	25	1.35	27	1.22	16.6
9.....	1.59	55	1.34	26	1.40	32	1.25	19.0
10.....	1.54	48	1.29	22	1.41	33	1.29	22
11.....	1.52	45	1.26	20	1.44	36	1.29	22
12.....	1.51	43	1.25	19.0	1.41	33	1.29	22
13.....	1.49	41	1.25	19.0	1.40	32	1.27	21
14.....	1.47	39	1.24	19.0	1.40	32	1.29	22
15.....	1.44	36	1.25	18.2	1.39	31	1.29	22
16.....	1.45	37	1.24	18.2	1.38	30	.....	.....
17.....	1.43	35	1.23	17.4	1.38	30	.....	.....
18.....	1.42	34	1.22	16.6	1.38	30	.....	.....
19.....	1.39	31	1.25	19.0	1.38	30	.....	.....
20.....	1.34	26	1.24	18.2	1.38	30	.....	.....
21.....	1.33	25	1.24	18.2	1.36	28	.....	.....
22.....	1.32	25	1.30	23	1.35	27	.....	.....
23.....	1.32	25	1.38	30	1.34	26	.....	.....
24.....	1.31	24	1.36	28	1.34	26	.....	.....
25.....	1.34	26	1.40	32	1.34	26	.....	.....
26.....	1.34	26	1.38	30	1.34	26	.....	.....
27.....	1.34	26	1.36	28	1.33	25	.....	.....
28.....	1.31	24	1.35	27	1.32	25	.....	.....
29.....	1.30	23	1.35	27	1.32	25	.....	.....
30.....	1.29	22	1.34	26	1.32	25	.....	.....
31.....	1.26	20	.....	.....	1.33	25	.....	.....

## MONTHLY DISCHARGE of Pekisko Creek at Pekisko, for 1912.

(Drainage area, 87 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	96	24	48.7	0.560	0.62	2,898
May.....	99	43	69.7	0.801	0.92	4,286
June.....	926	33	143.3	1.647	1.84	8,529
July.....	332	72	147.6	1.696	1.96	9,075
August.....	129	20	46.2	0.531	0.61	2,841
September.....	30	16.6	22.0	0.253	0.28	1,309
October.....	36	23	27.8	0.320	0.37	1,709
November (1-15).....	26	16.6	21.3	0.245	0.14	634
The period.....	.....	.....	.....	.....	6.74	31,281

## STIMSON CREEK NEAR PEKISKO.

This station was established on October 6, 1911, by L. R. Brereton. It was originally located at the traffic bridge on the S.E.  $\frac{1}{4}$  Sec. 14, Tp. 17, Rge. 2, W. 5th Mer., but as an observer could not be secured it was moved one and a half miles upstream on June 30, 1912, by F. R. Burfield. It is now located on the N.W.  $\frac{1}{4}$  Sec. 2, Tp. 17, Rge. 2, W. 5th Mer., near E. R. Baker's ranche.

The gauge is a plain staff graduated to feet and hundredths. It is spiked to a post driven into the bed of the stream near the right bank. The zero (elev. 90.20) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the right bank 19.5 feet northwest of the gauge.

The channel is straight for 100 feet above and below the gauge. Both banks are fairly high, grassy, and not liable to overflow. The bed is of gravel, clean, and not liable to shift.

Discharge measurements are made at a wading section about fifteen feet downstream from the gauge. In high water measurements may be made from a bridge about ten feet upstream from the gauge.

During June, 1912, the gauge was read by J. F. Mitchell, and after that by E. R. Baker.

### DISCHARGE MEASUREMENTS of Stimson Creek, near Pekisko, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 15.....	F. R. Burfield.....	45.5	53.4	0.69	1.36	36.72①
June 5.....	do.....	33	25.0	0.79	1.17	19.88①
July 4.....	do.....	36.5	27.8	1.29	1.70	36.02①
July 25.....	do.....	37.5	73.1	3.82	2.90	279.42①
Aug. 19.....	do.....	37	24.5	0.99	1.61	24.36①
Sept. 17.....	do.....	36	18.3	0.87	1.44	12.22①
Oct. 16.....	do.....	37.5	24.8	0.99	1.62	24.60①
Nov. 11.....	do.....	36.5	22.7	0.86	1.55	19.60①

①Gauging made at old station on N.E.  $\frac{1}{4}$  Sec. 14, Tp. 17, Rge. 2, W. 5th M.

②Gauging made at new station on N.W.  $\frac{1}{4}$  Sec. 2, Tp. 17, Rge. 2, W. 5th M.

### DAILY GAUGE-HEIGHT AND DISCHARGE of Stimson Creek, near Pekisko, for 1912.

DAY.	June.		July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	①1.25	26	1.90	71	1.86	64	1.54	17.8	1.50	15.2	1.51	15.9
2.....	①1.23	24	1.90	71	1.87	66	1.53	17.2	1.51	15.9	1.59	22
3.....	①1.20	22	1.80	53	2.28	146	1.55	18.5	1.45	12.5	1.52	16.5
4.....	1.18	21	1.81	55	2.43	177	1.51	15.9	1.41	10.7	1.79	51
5.....	1.17	20	1.64	28	2.33	156	1.52	16.5	1.43	11.6	1.71	38
6.....	1.10	16.5	1.68	33	2.04	98	1.51	15.9	1.54	17.8	1.83	58
7.....	①1.10	16.5	1.75	44	1.93	76	1.50	15.2	1.59	22	1.71	38
8.....	1.10	16.5	3.02	304	1.85	62	1.53	17.2	1.75	44	1.67	32
9.....	1.09	16.0	3.06	313	1.78	49	1.51	15.9	1.81	55	1.63	27
10.....	1.08	15.6	2.95	289	1.75	44	1.47	13.6	1.80	53	1.56	19.4
11.....	1.07	15.1	2.11	112	1.72	39	1.43	11.6	1.76	46	1.65	29
12.....	1.05	14.2	2.00	90	1.71	38	1.50	15.2	1.69	35	1.74	42
13.....	1.03	13.3	2.00	90	1.75	44	1.50	15.2	1.60	23	1.63	27
14.....	1.01	12.4	2.55	203	1.70	36	1.45	12.5	1.55	18.5	1.62	25
15.....	1.29	30.0	2.14	118	1.74	42	1.45	12.5	1.40	10.3	1.67	32
16.....	3.20	610	1.96	82	1.67	32	1.45	12.5	1.62	25	.....	.....
17.....	2.00	200	1.92	75	1.65	29	1.44	12.1	1.53	17.2	.....	.....
18.....	1.67	103	1.92	75	1.65	29	1.45	12.5	1.60	23	.....	.....
19.....	1.60	86	1.94	78	1.63	27	1.42	11.2	1.65	29	.....	.....
20.....	1.60	86	1.98	86	1.61	24	1.42	11.2	1.65	29	.....	.....
21.....	1.50	63	1.98	86	1.59	22	1.41	10.7	1.70	36	.....	.....
22.....	1.35	37	1.90	71	1.55	18.5	1.47	13.6	1.67	32	.....	.....
23.....	1.32	33	2.24	138	1.66	19.4	1.50	15.2	1.54	17.8	.....	.....
24.....	1.29	30	2.58	209	1.56	19.4	1.50	15.2	1.57	20	.....	.....
25.....	1.25	26	2.86	270	1.53	17.2	1.48	14.1	1.58	21	.....	.....
26.....	1.20	22	2.56	205	1.54	17.8	1.50	15.2	1.60	23	.....	.....
27.....	1.16	19.6	2.18	126	1.55	18.5	1.51	15.9	1.59	22	.....	.....
28.....	1.15	19.0	2.02	94	1.54	17.8	1.52	16.5	1.54	17.8	.....	.....
29.....	1.13	18.0	1.95	80	1.54	17.8	1.50	15.2	1.52	16.5	.....	.....
30.....	1.22	24	1.90	71	1.51	15.9	1.50	15.2	1.53	17.2	.....	.....
31.....	.....	.....	1.88	67	1.50	15.2	.....	.....	1.60	23	.....	.....

Records for June were taken at the old gauging station on N.-E.  $\frac{1}{4}$  Sec. 14, Tp. 17, Rge 2, W. 5th Mer.

① Gauge height interpolated.

## SESSIONAL PAPER No. 254

## MONTHLY DISCHARGE of Stimson Creek, near Pekisko, for 1912.

(Drainage area, 78 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June.....	610	12.4	55.2	0.726	0.810	3,284
July.....	313	28	119.0	1.568	1.81	7,317
August.....	177	15.2	47.7	0.627	0.72	2,930
September.....	18.5	10.7	14.6	0.192	0.21	867
October.....	55	10.3	24.5	0.323	0.37	1,506
November (1-15).....	58	15.9	31.5	0.414	0.23	937
The period.....					4.15	16,841

## FINDLAY AND MCDUGAL DITCH, NEAR HIGH RIVER.

This station was established on June 17, 1911, by J. C. Milligan. It is located on the S.W.  $\frac{1}{4}$  Sec. 31, Tp. 18, Rge. 29, W. 4th Mer., about four and a half miles west of the town of High River.

The gauge is a plain staff, graduated to feet and inches. It is nailed to a post driven into the left bank of the ditch. The zero (elev. 99.25) is referred to a permanent iron bench mark (assumed elev. 100.00) situated on the right bank, about fifty feet downstream from the gauge.

The channel is straight for 150 feet above and below the station. The right bank is built up from the excavation of the ditch, and would overflow if the headgates were opened to their fullest extent. The left bank is high and clean and will not overflow. The bed is of mud, but is not liable to shift.

Discharge measurements are made with meter and rods at a wading section near the gauge. The gauge was not read during 1912 and in consequence the daily discharges cannot be computed.

## DISCHARGE MEASUREMENTS of Findlay &amp; McDougal Ditch near High River, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 10.....	C. Chambers	5.7	3.27	0.60	0.77	1.96
May 16.....	F. R. Burnfield	5.3	3.02	0.67	0.79	2.03
June 6.....	do	7.8	5.02	0.91	1.15	4.58
July 27.....	do	4.4	1.81	0.61	0.63	1.11
Aug. 21.....	do	4.4	1.50	0.32	0.58	0.48
Sept. 19.....	do				Dry.	Nil.

## LITTLE BOW DITCH AT HIGH RIVER.

This canal, about 2,000 feet in length, was built by the Alberta Government, to divert water from Highwood River into Little Bow River. At a point about two miles above the town of High River, water is turned from the Highwood River into a spring creek, and at the confluence of that creek with the Highwood, a dam diverts the waters of the spring creek into the Little Bow Ditch, and thence into the Little Bow River. This dam has been washed out on two occasions, the latter being during the floods of June 16, 1912. During August and September a new dam was built, the ditch repaired and water turned in again on September 16.

The gauging station, located on the S.W.  $\frac{1}{4}$  Sec. 6, Tp. 19, Rge. 28, W. 4th Mer., 100 feet from the power station and pumping well of the town of High River, was established August 1, 1910, by J. C. Keith.

The gauge, which is a plain staff graduated to feet and hundredths, is fastened to the left bank. The zero (elev. 92.07) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the right bank sixty feet upstream from the gauge. Prior to the reconstruction of the ditch, the elevation of the zero of the gauge was 91.06.

The channel is straight for several hundred feet above and below the station. Both banks are high, clean, and steep and will not overflow.

Discharge measurements are made by wading, or from planks laid across the ditch, with current meter and rods.

During 1912, the gauge was read daily by Mr. Philip Weinard.

#### DISCHARGE MEASUREMENTS of Little Bow Ditch, at High River, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 25.....	N. McL. Sutherland .....	10.0	15.63	1.28	1.85	20.08
April 9.....	do .....	10.2	12.75	1.00	1.56	12.75
May 17.....	F. R. Burfield .....	11.0	22.40	1.70	2.44	37.97
June 4.....	do .....	14.5	15.92	1.70	2.09	27.02
July 2.....	do .....	.....	.....	.....	0.83	Nil.
July 27.....	do .....	13.4	7.24	1.35	1.49	9.65
Aug. 17.....	do .....	.....	Dry.	.....	Dry.	Nil.
Sept. 16.....	do .....	13.7	18.84	0.86	0.81	16.15
Oct. 15.....	do .....	14.5	29.07	2.41	2.04	70.20
Nov. 9.....	do .....	14.5	20.90	2.19	1.85	58.73
Nov. 19.....	do .....	14.5	28.33	2.25	1.96	63.91

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Little Bow Ditch, at High River, for 1912.

DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.73	16.0	1.89	21	2.19	30	0.64	Nil.
2.....			1.73	16.0	1.89	21	2.19	30	0.74	"
3.....			1.79	17.7	1.89	21	2.15	28	0.89	0.50
4.....			1.73	16.0	1.89	21	2.09	27	0.84	0.05
5.....			1.52	10.9	1.89	21	2.06	26	0.94	1.16
6.....			1.44	9.3	1.94	22	2.04	25	1.01	2.14
7.....			1.47	9.9	1.87	20	2.02	25	0.99	1.86
8.....			1.49	10.3	2.04	25	2.04	25	1.64	13.7
9.....			1.54	11.4	2.16	29	2.13	28	1.79	17.7
10.....			1.79	17.7	2.13	28	2.14	28	1.59	12.5
11.....			1.74	16.2	2.03	25	2.14	28	1.34	7.3
12.....			1.74	16.2	2.03	25	2.17	29	1.14	4.0
13.....			1.74	16.2	2.06	26	2.14	28	1.34	7.3
14.....			1.76	16.8	2.24	31	2.74	48	1.59	12.5
15.....			1.74	16.2	2.49	40	2.74	48	1.44	9.3
16.....			1.74	16.2	2.49	40	5.06	132	1.34	7.3
17.....			1.73	16.0	2.49	40	3.01	57	1.32	7.0
18.....			1.72	15.7	2.24	31	1.99	24	1.23	5.5
19.....			1.72	15.7	2.29	35	1.34	7.3	1.14	4.0
20.....			1.72	15.7	2.29	33	1.29	6.4	1.24	5.6
21.....	1.27	6.1	1.73	16.0	2.29	33	1.17	4.5	1.33	7.1
22.....	1.26	6.0	1.74	16.2	2.34	35	1.04	2.6	1.23	5.5
23.....	1.59	12.5	1.76	16.8	2.47	39	0.87	0.30	1.24	5.6
24.....	1.64	13.7	1.79	17.7	2.47	39	0.84	0.05	1.43	9.1
25.....	2.04	25.2	1.79	17.7	2.55	42	0.84	0.05	1.94	22.2
26.....	1.84	19.2	1.82	18.6	2.62	44	0.79	Nil.	1.65	13.9
27.....	1.69	14.9	1.81	18.3	2.67	46	0.57	"	1.55	11.6
28.....	1.89	20.7	1.78	17.4	2.62	44	0.53	"	1.35	7.5
29.....	1.73	16.0	1.77	17.1	2.43	37	Dry.	"	1.35	7.5
30.....	1.68	14.7	1.98	23.4	2.34	35	0.69	"	1.21	5.2
31.....	1.69	14.9	.....	.....	2.29	33	.....	.....	1.14	4.0

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DAILY GAUGE-HEIGHT AND DISCHARGE of Little Bow Ditch, at High River, for 1912.—*Concluded.*

DAY.	August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.10	3.4	Dry.	Nil.	1.86	59	2.53	95	2.34	①
2.....	Dry.	Nil.	"	"	1.90	61	2.48	92	2.62	.....
3.....	"	"	"	"	1.88	60	1.90	61	2.83	.....
4.....	"	"	"	"	1.90	61	1.88	60	2.88	.....
5.....	"	"	"	"	1.95	64	1.88	60	2.91	.....
6.....	"	"	"	"	1.94	63	2.06	70	2.96	.....
7.....	"	"	"	"	1.88	60	1.92	62	3.02	.....
8.....	"	"	"	"	2.00	67	1.88	60	2.94	.....
9.....	"	"	"	"	2.10	72	1.87	60	2.66	.....
10.....	"	"	"	"	2.05	69	1.90	61	2.25	.....
11.....	"	"	"	"	2.06	70	1.86	59	2.11	.....
12.....	"	"	"	"	2.05	69	1.77	54	2.32	.....
13.....	"	"	"	"	2.03	68	1.92	62	2.63	.....
14.....	"	"	"	"	2.05	69	1.90	61	2.67	.....
15.....	"	"	"	"	2.05	69	1.72	52	2.53	.....
16.....	"	"	0.81	16.3	2.03	68	1.77①	54	2.13	.....
17.....	"	"	0.85	17.4	2.06	70	1.85①	59	2.52	.....
18.....	"	"	0.84	17.1	2.05	69	1.92①	62	2.57	.....
19.....	"	"	0.84	17.1	2.03	68	1.97	65	2.23	.....
20.....	"	"	0.85	17.4	2.03	68	1.87	60	2.01	.....
21.....	"	"	0.85	17.4	1.93	63	1.67	50	1.87	.....
22.....	"	"	0.90	18.8	1.90	61	1.72	52	2.05	.....
23.....	"	"	0.94	20.0	2.00	67	1.71	52	1.82	.....
24.....	"	"	1.90	61	1.95	64	1.71	52	2.18	.....
25.....	"	"	2.00	67	1.85	59	2.52	95	2.04	.....
26.....	"	"	2.00	67	1.92	62	2.36	86	1.93	.....
27.....	"	"	1.95	64	1.89	61	2.42	80	1.72	.....
28.....	"	"	1.95	64	1.87	60	2.80	109	2.62	.....
29.....	"	"	1.95	64	2.54	95	2.82	110	.....	.....
30.....	"	"	1.90	61	2.44	90	2.65	101	.....	.....
31.....	"	"	.....	.....	2.44	90	.....	.....	.....	.....

① Ice conditions during December. Insufficient data to compute discharges.

## MONTHLY DISCHARGE of Little Bow Ditch at High River, for 1912.

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.
	Maximum.	Minimum.	Mean.	
March (21-31).....	25.2	6.0	14.9	325
April.....	23.4	9.3	16.1	938
May.....	46	20	31.6	1,944
June.....	132	Nil.	22.9	1,363
July.....	22.2	"	7.06	433
August.....	3.4	"	0.11	7
September.....	67	16.3	39.3	1,160
October.....	95	59	67.6	4,157
November.....	110	50	68.8	4,096
The period.....	.....	.....	.....	14,443



## HIGHWOOD RIVER AT HIGH RIVER.

This station was first established some years ago, by the Irrigation Surveys. It was re-established on May 28, 1908, by P. M. Sauder. It is located at the highway bridge in the town of High River, on the N.W.  $\frac{1}{4}$  Sec. 6, Tp. 19, Rge. 28, W. 4th Mer.

A plain gauge staff graduated to feet and hundredths, is fastened vertically to the downstream face of the centre pier. The zero (elev. 91.62) is referred to a bench mark (assumed elev. 100.00) on the southwest corner of the concrete pier supporting the north end of the Canadian Pacific Railway bridge.

The channel is straight for about 300 feet above and below the station. The right bank is low and liable to overflow. It is composed of gravel and sand and covered with brush. The left bank is low but is protected from overflow by a crib work. The current is swift in high stages of the stream, but is sluggish in low water.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the inside edge of the crib abutment, supporting the north end of the bridge. Distances are marked on the bottom chord of the bridge at every five feet from the initial point. There is an eddy about the centre pier and special care must be exercised by the hydrographer in making discharge measurements at this station. At extreme low water, a check measurement is made at a wading station about 300 yards below the bridge.

Little Bow Ditch diverts water from Highwood River at a point about two miles above this station. During a flood on June 15 and 16, a dam separating the waters of the ditch from the river about half a mile above the station was breached and in consequence the ditch was dry until September 16, when the repairs were completed.

During a flood in 1908, Highwood River overflowed its left bank some distance above the traffic bridge and did considerable damage to property. To prevent a repetition of this occurrence, a highwater overflow channel has been constructed from the Lineham mill pond to the river. The water carried off through this spillway does not pass the gauging station. Miscellaneous measurements of this flow were made on the same day that Highwood River was measured. The discharge of this spillway and that of Little Bow Ditch should both be added to the discharge of Highwood River to obtain the total yield of the drainage area.

During 1912, the gauge was read daily by W. E. M. Holmes.

## DISCHARGE MEASUREMENTS of Highwood River at High River, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 17.....	F. R. Burfield.....	159.5	425.5	3.27	3.50	1,395.0
June 4.....	do .....	134.0	294.4	1.91	2.95	563.5
July 3.....	do .....	144.0	587.6	2.08	3.72	1,222.7
July 24.....	do .....	146.0	652.2	2.33	3.98	1,519.0
Aug. 17.....	do .....	141.5	476.9	1.15	2.85	547.6
Sept. 16.....	do .....	138.0	387.5	0.70	2.21	271.8
Oct. 15.....	do .....	138.0	391.5	0.63	2.24	244.8
Nov. 9.....	do .....	137.5	358.5	0.49	2.00	175.1
Nov. 19.....	do .....	137.5	361.5	0.51	2.02	183.2

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Highwood River, at High River, for 1912.

DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.45	285	2.44	280	2.99	624	3.43	945
2.....			2.69	419	2.39	256	2.96	605	3.44	954
3.....			2.50	310	2.41	265	2.93	587	3.44	954
4.....			2.63	383	2.41	265	2.87	553	3.45	962
5.....			2.42	270	2.40	260	2.84	535	3.52	1,024
6.....			2.48	300	2.43	275	2.80	513	3.55	1,052
7.....			2.15	162	2.44	280	2.78	502	3.64	1,140
8.....			2.27	206	2.55	335 <sup>①</sup>	2.87	553	4.05	1,605
9.....			2.64	389	3.66	1,510	2.98	618	3.98	1,516
10.....			2.70	425	2.57	570	2.91	576	3.40	920
11.....			2.63	383	2.79	520	2.90	570	3.52	1,024
12.....			2.55	335	2.80	550	2.90	570	3.44	954
13.....			2.48	300	2.81	570	2.88	558	4.50	2,240
14.....			2.45	285	2.95	700	3.01	636	3.45	962
15.....			2.48	300	3.06	820	4.53	2,291	3.46	971
16.....			2.55	335	3.53	1,470	7.00	6,720	3.50	1,005
17.....			2.51	315	3.34	1,160	5.75	4,470	3.62	1,120
18.....			2.46	290	3.26	1,030	4.96	3,048	3.58	1,081
19.....			2.40	260	3.24	1,003	4.34	1,896	3.60	1,100
20.....			2.53	325	3.18	930	3.98	1,516	3.62	1,120
21.....			2.45	285	3.16	895	3.82	1,329	3.55	1,052
22.....			2.43	275	3.10	820	3.73	1,232	3.64	1,140
23.....			2.48	300	3.14	860	3.65	1,150	3.62	1,120
24.....	2.88	①	2.43	275	3.12	830	3.53	1,033	3.63	1,130
25.....	2.75		2.36	242	3.14	850	3.40	920	3.65	1,150
26.....	2.65		2.40	260	3.23	940	3.40	920	3.76	1,264
27.....	2.65		2.41	265	3.26	960	3.38	904	3.87	1,386
28.....	2.63		2.42	270	3.33	1,035	3.36	888	3.87	1,386
29.....	2.54		2.43	275	3.22	900	3.34	872	3.86	1,374
30.....	2.45		2.40	260	3.17	830	3.45	962	3.85	1,363
31.....	2.42				3.07	720			3.82	1,329

① Ice conditions during March. Insufficient data to compute discharges.

② Shifting conditions May 8 to June 1.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Highwood River at High River, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.76	1,264	2.50	366	2.15	229	1.70	98
2.....	3.73	1,232	2.40	323	2.12	219	2.30	284
3.....	3.76	1,264	2.40	323	2.11	215	2.00	182
4.....	3.55	1,052	2.38	315	2.12	219	1.80	124
5.....	3.44	954	2.36	307	2.15	229	1.85	138
6.....	3.33	864	2.41	327	2.13	222	1.83	132
7.....	3.20	765	2.48	357	2.14	226	1.84	135
8.....	3.16	737	2.52	375	2.15	229	1.88	146
9.....	3.09	688	2.50	366	2.18	240	1.90	152
10.....	3.00	630	2.45	344	2.20	247	1.95	167
11.....	2.98	618	2.44	340	2.21	251	1.99	179
12.....	2.97	611	2.38	315	2.22	254	2.00	182
13.....	2.93	587	2.34	299	2.22	254	2.01	185
14.....	2.89	564	2.30	284	2.22	254	2.02	188
15.....	2.87	553	2.28	276	2.23	258	2.20	247
16.....	2.85	541	2.25	265	2.25	265	2.15 (i)	229
17.....	2.85	541	2.23	258	2.23	258	2.10 (i)	212
18.....	2.68	450	2.22	254	2.22	254	2.05 (i)	197
19.....	2.75	486	2.22	254	2.18	240	2.02	188
20.....	2.72	470	2.20	247	2.15	229	1.90	152
21.....	2.69	455	2.23	258	2.13	222	1.91	155
22.....	2.65	436	2.25	265	2.12	219	1.93	161
23.....	2.60	412	2.25	265	2.11	215	1.92	158
24.....	2.58	403	2.25	265	2.00	182	.....	.....
25.....	2.56	394	2.25	265	2.00	182	.....	.....
26.....	2.60	412	2.26	269	2.00	182	.....	.....
27.....	2.60	412	2.25	265	2.08	206	.....	.....
28.....	2.60	412	2.22	254	2.03	191	.....	.....
29.....	2.62	422	2.18	240	2.00	182	.....	.....
30.....	2.60	412	2.18	240	1.95	167	.....	.....
31.....	2.58	403	.....	.....	1.72	103	.....	.....

(i) Gauge heights interpolated.

## MONTHLY DISCHARGE of Highwood River at High River, for 1912.

(Drainage area, 756 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	425	242	300	0.397	0.443	17,851
May.....	1,510	256	732	0.968	1.116	45,009
June.....	6,720	502	1,275	1.69	1.886	75,870
July.....	2,240	920	1,172	1.55	1.787	72,064
August.....	1,264	394	627	0.829	0.956	37,938
September.....	375	240	293	0.387	0.432	17,435
October.....	265	103	221	0.292	0.337	13,589
November (1-23).....	284	98	174	0.230	0.196	7,936
The period.....	.....	.....	.....	.....	7.153	287,692

NOTE.—To obtain the total flow of this stream at this point the discharge of the Little Bow Ditch and Lineham Spillway must be added. This has not been done in obtaining these results.

## HIGHWOOD RIVER NEAR ALDERSYDE.

This station was established October 3, 1911, by L. R. Brereton. It is located at the traffic bridge on the surveyed trail about one mile east of Aldersyde, in the N.W.  $\frac{1}{4}$  Sec. 17, Tp. 20, Rge. 28, W. 4th Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed near the upstream end of the left or north face of the centre pier. The zero (elev. 90.64) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the left bank, near the north end of the bridge.

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The channel is straight for 1,000 feet above and 150 feet below the station. Both banks are high, clear of brush and not liable to overflow. The bed is of coarse gravel with a scattering of large stones and boulders in and near the section. The latter affect the velocity observations to some extent. The current is swift.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the stream face of the north, or left abutment.

The gauge was read once daily by L. W. Barrett, a farmer living within 100 yards of the bridge, but, owing to the gauge being defaced, no reliable records were obtained before the end of May.

The discharge of the Little Bow Ditch at High River should be added to those given to obtain the total yield of the drainage area.

## DISCHARGE MEASUREMENTS of Highwood River, near Aldersyde, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 14.....	F. R. Burfield.....	139.5	295.8	2.43	1.70	717.2
May 31.....	do.....	155	302.0	2.61	1.88	787.8
June 29.....	do.....	171	332.9	3.11	2.18	1,037.4
July 23.....	do.....	183	385.5	3.80	2.45	1,464.4
Aug. 16.....	do.....	156	288.2	2.36	1.82	678.2
Sept. 13.....	do.....	138	203.5	1.58	1.34	322.5
Oct. 14.....	do.....	134	188.2	1.65	1.32	309.5
Nov. 8.....	do.....	90	134.9	0.98	1.28	131.8

## DAILY GAUGE-HEIGHT AND DISCHARGE of Highwood River, near Aldersyde, for 1912.

DAY.	June.		July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.88	732	2.28	1,148	2.25	1,114	3.....	1.24	271	.....	.....	.....
2.....	1.78	642	2.23	1,092	2.20	1,060	.....	1.21	255	.....	.....	.....
3.....	1.83	686	2.28	1,148	2.23	1,092	.....	1.19	245	.....	.....	.....
4.....	1.74	608	2.40	1,290	2.38	1,266	.....	1.16	231	.....	.....	.....
5.....	1.72	591	2.33	1,206	② 2.28	1,148	.....	1.21	255	.....	.....	.....
6.....	1.68	559	2.33	1,206	2.18	1,038	.....	1.24	271	.....	.....	.....
7.....	1.63	520	2.38	1,266	2.13	986	.....	1.22	260	1.13	①.....	.....
8.....	1.68	559	2.98	2,032	2.13	986	.....	1.26	281	1.16	.....	.....
9.....	1.74	608	3.53	2,898	2.08	953	.....	1.36	337	1.13	.....	.....
10.....	1.86	713	3.23	2,425	2.03	881	.....	1.34	325	1.11	.....	.....
11.....	1.83	686	③ 3.05	2,155	1.98	829	.....	1.31	309	1.13	.....	.....
12.....	1.84	695	2.88	1,912	1.98	829	.....	1.34	325	1.73	.....	.....
13.....	1.98	829	② 2.95	2,010	1.93	779	1.35	331	1.34	325	1.22	.....
14.....	2.38	1,266	3.03	2,125	1.88	732	1.36	337	1.31	309	1.24	.....
15.....	2.03	881	2.88	1,912	1.83	686	1.36	337	② 1.29	298	1.26	.....
16.....	6.88	10,728	2.73	1,702	1.83	686	1.56	467	② 1.27	287	1.18	.....
17.....	5.18	6,312	2.58	1,506	1.83	686	1.36	337	1.24	271	1.16	.....
18.....	4.13	4,010	2.48	1,386	1.86	713	1.56	467	1.26	281	1.16	.....
19.....	3.58	2,984	2.38	1,266	1.85	704	1.31	309	1.26	281	.....	.....
20.....	3.28	2,500	② 2.45	1,340	1.78	642	1.36	337	1.22	260	1.25	.....
21.....	3.03	2,125	2.48	1,386	1.73	600	1.34	325	1.21	255	1.05	.....
22.....	2.83	1,842	2.53	1,446	② 1.70	573	1.36	337	1.20	250	1.14	.....
23.....	2.63	1,569	2.46	1,362	② 1.67	551	1.41	366	1.21	255	.....	.....
24.....	2.33	1,206	2.60	1,530	② 1.64	524	1.34	325	1.21	255	1.33	.....
25.....	2.33	1,206	3.18	2,350	③ 1.61	505	1.36	337	1.20	250	1.16	.....
26.....	2.28	1,148	3.18	2,350	② 1.58	482	1.36	337	1.16	231	1.16	.....
27.....	2.33	1,206	2.98	2,052	② 1.55	460	1.34	325	1.14	221	1.33	.....
28.....	2.28	1,148	2.58	1,506	1.53	446	1.36	337	1.16	231	1.62	.....
29.....	2.24	1,103	2.48	1,386	1.53	446	1.34	325	1.14	221	1.75	.....
30.....	2.23	1,092	2.38	1,266	1.53	446	1.31	309	1.26	281	1.33	.....
31.....	.....	.....	2.33	1,206	② 1.53	446	.....	.....	1.21	255	.....	.....

① Ice conditions at gauge during November. Insufficient data to compute discharges.

② Gauge heights interpolated from those at High River.

③ No observations from Sept. 1 to 12.

## MONTHLY DISCHARGE of Highwood River near Aldersyde, for 1912.

(Drainage area, 889 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per Square mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June.....	10,728	520	1,692	1.903	2.12	100,668
July.....	2,898	1,092	1,642	1.846	2.13	100,949
August.....	1,266	446	751	0.844	0.97	46,159
September (13-30).....	467	309	347	0.390	0.26	12,385
October.....	337	221	270	0.304	0.35	16,625
The period.....					5.83	276,786

NOTE.—Exceptional rains in the mountains during June 14 to 16 caused the river to rise to a maximum gauge height of 8.20, at which the flow would be over 13,000 sec.-feet.

These records do not include the discharge of Little Bow Ditch at High River.

## BOW RIVER NEAR BASSANO.

This station was established on August 20, 1909, by the Irrigation Department of the Canadian Pacific Railway Company. It is located in Sec. 1, Tp. 21, Rge. 19, W. 4th Mer., at the Horseshoe bend on Bow River, near the east boundary of the Blackfoot Indian Reserve, and is about three miles southwest of Bassano and one mile upstream from the Canadian Pacific Railway Company's dam.

The gauge, which is a plain staff graduated to feet and hundredths, is situated in the bed of the stream near the left bank. The zero (elev. 2517.90) is referred to a peg in the bank (elev. 2549.99) and also to the iron peg holding the stay on the upstream side of the staff (elev. 2531.50).

The channel is straight for 600 feet above and 2,000 feet below the station. The left bank is high, composed of clay, and covered with brush near the water's edge. The right bank is high, steep, sparsely covered with brush, and composed of gravel. The bed of the stream is composed of gravel and during low water and at ordinary stages, there is a wide gravel beach at the left bank. The current has a moderate velocity.

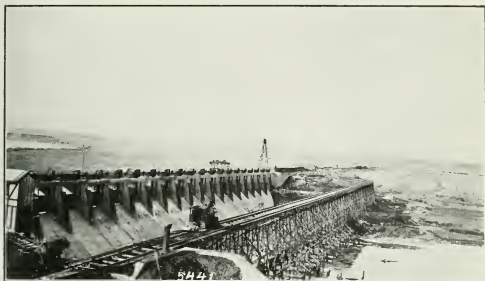
Discharge measurements are made by means of a cable and car. The initial point for soundings is a stake on the left bank and distances are marked at every 20 feet on the cable by white paint.

The daily fluctuation in water level was read on a gauge near the dam, by the Canadian Pacific Railway Company, but as these were affected by backwater from the dam they could not be used in computing daily discharges. Results of gaugings made by C. J. Loomer, an engineer in the employ of the Canadian Pacific Railway Company, were supplied by A. S. Dawson, chief engineer of the Department of Natural Resources, Canadian Pacific Railway Company.

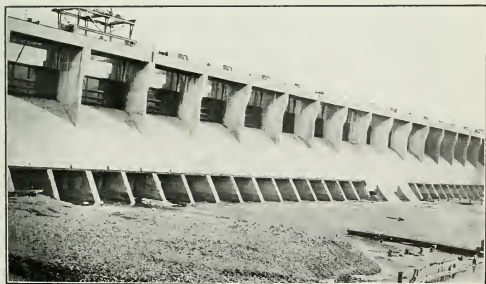
## DISCHARGE MEASUREMENTS of Bow River, near Bassano, in 1912.

Date.	Hydrographer.	Width.		Mean Velocity.	Gauge ① Height.	Discharge.
		Feet.	Sq. ft.			
April 17.....	C. J. Loomer.....	3 40	2,504	1 46	2 81	3,666
May 3.....	do.....	3 50	2,505	1 40	2 85	3,516
May 29.....	do.....	3 80	3,178	2 32	4 86	7,366
June 14.....	F. R. Burfield.....	3 78	2,819	2 18	3 60	6,156
July 10.....	C. J. Loomer.....	3 90	5,114	4 45	8 80	22,930
July 12.....	F. R. Burfield.....	4 07	4,388	4 33	7 70	18,994
Aug. 1.....	do.....	3 98	3,490	2 60	5 28	9,956
Aug. 27.....	do.....	4 02	3,559	3 20	6 40	11,404

① Gauge heights from gauge, near dam, on bridge pile.



View of Upstream face of Canadian Pacific Railway Company's Dam in Bow River near Bassano, Alberta (almost finished). Taken by P. M. Sauder.



View of Downstream face of Canadian Pacific Railway Company's Dam in Bow River near Bassano, Alberta (almost finished). Taken by P. M. Sauder.



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## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Bow River drainage basin, in 1912.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
Sept. 17.....	H. C. Ritchie....	Baker Creek.....	S.E. 32-27-15-5..	28.9	31.3	2.35	73.6
Jan. 25.....	V. A. Newhall....	Bath Creek.....	N.E. 32-28-16-5..	34.0	11.36	1.604	11.41
Feb. 6.....	do	do	do	10.0	6.30	1.846	11.63
" 25.....	do	do	do	11.0	6.30	1.846	11.63
" 28.....	do	do	do	10.0	6.20	1.600	9.91
Mar. 7.....	do	do	do	11.0	6.30	1.43	8.98
" 19.....	do	do	do	10.6	4.33	1.575	6.82
" 29.....	do	do	do	11.0	6.40	1.68	10.78
Apr. 10.....	do	do	do	11.0	7.70	2.10	16.10
" 25.....	H. C. Ritchie....	do	do	11.0	6.60	1.78	11.79
May 10.....	do	do	do	12.0	7.50	2.25	16.87
" 23.....	do	do	do	14.0	11.40	2.79	31.84
June 6.....	do	do	do	37.5	10.00	3.06	30.56
" 20.....	do	do	do	37.5	44.8	5.07	227.26
July 5.....	do	do	do	49.0	52.6	4.23	222.31
" 19.....	do	do	do	49.5	41.30	3.82	157.95
Aug. 2.....	do	do	do	50.0	57.50	4.37	251.06
" 14.....	do	do	do	41.4	39.56	3.50	135.55
" 29.....	do	do	do	33.5	42.05	5.06	212.85
Sept. 12.....	do	do	do	39.6	34.1	2.56	86.3
Oct. 5.....	H. R. Cram.....	do	do	30.0	20.8	2.36	49.0
" 18.....	H. C. Ritchie....	do	do	21.5	14.5	2.42	35.1
Nov. 2.....	do	do	do	21.4	14.9	1.92	28.7
" 13.....	do	do	do	20.7	13.5	1.60	21.5
" 28.....	do	do	do	20.9	12.7	1.52	19.34
Dec. 14.....	do	do	do	20.8	12.03	1.33	16.02
Apr. 17.....	do	Beaure Creek.....	S.E. 15-26-5-5..	9.0	5.80	1.76	10.19
May 16.....	do	do	do	10.5	6.45	0.70	4.51
" 30.....	do	do	do	11.0	7.70	1.22	9.41
June 14.....	do	do	do	11.4	7.79	0.62	4.88
" 27.....	do	do	do	11.5	8.23	0.91	8.00
July 11.....	do	do	do	12.	16.05	2.07	33.22
" 26.....	do	do	do	12.	20.25	2.86	57.92
Aug. 8.....	do	do	do	12.3	13.80	1.69	23.30
" 22.....	do	do	do	12.2	11.69	1.25	14.61
Sept. 4.....	do	do	do	12.1	14.32	1.58	22.6
" 26.....	H. R. Cram.....	do	do	10.5	11.33	1.80	20.4
Oct. 11.....	do	do	do	12.2	14.6	1.63	23.7
" 24.....	H. C. Ritchie....	do	do	12.3	13.7	1.46	20.0
Nov. 8.....	do	do	do	13.0	Ice and slush	Ice	
April 17.....	do	Bighill Creek.....	S.W. 10-26-4-5..	10.0	9.20	1.21	11.12
May 16.....	do	do	do	11.5	5.75	1.04	5.98
" 30.....	do	do	do	11.3	6.47	1.14	7.34
June 14.....	do	do	do	11.3	5.34	0.89	4.76
" 27.....	do	do	do	11.3	5.57	0.97	5.32
July 11.....	do	do	do	13.4	12.18	1.97	23.95
" 26.....	do	do	do	14.0	13.65	2.10	28.72
Aug. 8.....	do	do	do	12.0	10.20	1.72	17.54
" 22.....	do	do	do	12.0	11.20	1.73	19.33
Sept. 4.....	do	do	do	13.8	13.9	2.14	29.8
" 26.....	H. R. Cram.....	do	do	15.2	15.78	2.40	37.8
Oct. 11.....	do	do	do	14.6	15.28	2.39	36.48
" 24.....	H. C. Ritchie....	do	do	12.2	13.6	2.00	27.04
Nov. 8.....	do	do	do	13.0	Ice and slush	Ice	
June 6.....	do	Chalet Creek.....	N.E. 20-28-16-5..	14.7	16.18	3.65	1.28
" 20.....	do	do	do	16.2	19.46	3.21	59.13
July 5.....	do	do	do	16.3	21.97	2.98	62.42
" 19.....	do	do	do	19.5	26.36	3.23	65.84
Aug. 2.....	do	do	do	17.3	22.08	2.98	95.22
" 14.....	do	do	do	27.1	28.05	3.18	65.9
" 30.....	do	do	do	23.5	16.11	2.57	89.13
Sept. 13.....	do	do	do	16.5	10.4	2.05	41.4
Oct. 5.....	H. R. Cram.....	do	do	12.5	5.25	1.84	21.4
" 18.....	H. C. Ritchie....	do	do	9.6	4.34	1.03	9.67
Nov. 2.....	do	do	do				4.46
July 24.....	H. R. Carscallen	C.P.R. Canal Swastika Distribut'y	S.E. 2-27-25-4...	8.3	4.83	0.663	3.20
" 24.....	do	C.P.R. Canal East Branch of secondary "C"....	S.E. 34-26-25-4...	21.5	24.85	0.971	24.12
July 24.....	do	do	do	24.3	32.81	0.853	27.98
July 27.....	do	do	S.W. 27-26-26-4...	30.8	46.37	0.531	24.62
Aug. 1.....	do	do	N.E. 25-25-27-4...	37.4	20.94	1.129	23.65
" 21.....	do	C.P.R. Canal secondary "A"....	N.W. 2-24-28-4...	35.5	82.96	1.78	147.90
" 22.....	do	do	S.W. 31-22-26-4...	31.5	67.02	2.067	138.6
" 29.....	do	C.P.R. Canal secondary "B"....	S.E. 5-25-27-4...	21.4	12.81	0.546	6.99
" 29.....	do	do	do	31.9	32.59	0.82	26.74
Aug. 14.....	F. R. Burfield....	Fish Creek (North Fork).....	S.E. 22-22-3-5...	19.3	24.07	1.38	33.34
" 14.....	do	Fish Creek (South Fork).....	do	25.0	27.30	1.26	34.31



MISCELLANEOUS DISCHARGE MEASUREMENTS made in Bow River drainage basin, in 1912.  
Concluded.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
Apr. 17....	H. C. Ritchie...	Grand Valley Creek	S.W. 24-26-5-5..	6.5	2.50	1.36	3.41
May 16....	do .....	do .....	do .....	5.5	1.47	0.53	0.79
" 30....	do .....	do .....	do .....	6.0	2.20	0.695	1.53
June 14....	do .....	do .....	do .....	Estimat ed.			0.50
July 11....	do .....	do .....	do .....	6.2	1.83	0.62	1.14
" 26....	do .....	do .....	do .....	9.0	4.80	2.31	11.11
Aug. 8....	do .....	do .....	do .....	9.5	6.35	2.77	17.56
" 22....	do .....	do .....	do .....	7.8	3.56	1.62	5.78
Sept. 4....	do .....	do .....	do .....	7.7	3.64	1.39	5.05
" 26....	do .....	do .....	do .....	8.0	4.60	1.75	8.06
Oct. 11....	do .....	do .....	do .....	10.4	5.87	1.45	8.54
" 24....	do .....	do .....	do .....	10.	6.15	1.82	11.2
Nov. 8....	do .....	do .....	do .....	7.8	4.16	1.54	6.42
Sept. 20....	do .....	Healey Creek	S.W. 29-35-12-5.	4.6	49.7	2.75	136.9
April 17....	do .....	Horse Creek	N.E. 8-26-4-5..	10.0	4.60	0.80	3.70
May 16....	do .....	do .....	do .....	7.0	1.40	0.50	0.71
June 14....	do .....	do .....	do .....	8.0	2.0	0.62	1.24
July 11....	do .....	do .....	do .....	Nearly dry.	Just a trickle.		
" 26....	do .....	do .....	do .....	Estimat ed.			0.33
Aug. 8....	do .....	do .....	do .....	10.5	6.33	1.60	10.17
" 22....	do .....	do .....	do .....	14.5	12.85	2.08	26.68
Sept. 4....	do .....	do .....	do .....	10.4	5.69	1.27	7.25
" 26....	do .....	do .....	do .....	10.3	6.05	0.93	5.62
Oct. 11....	H. R. Cram....	do .....	do .....	13.	7.60	1.38	10.46
" 24....	do .....	do .....	do .....	11.0	7.60	1.70	12.9
Sept. 19....	H. C. Ritchie...	do .....	do .....	16.1	10.9	1.88	17.3
April 20....	do .....	do .....	do .....	10.8	9.96	1.47	14.6
May 29....	do .....	Johnson Creek	S.W. 26-26-14-5	31.	29.9	2.32	69.3
Sept. 14....	do .....	Kidney Springs	Banff				① .0613:
Sept. 17....	C. Chambers...	Marston Spring	N.E. 5-17-4-5..	3.6	0.93	0.94	0.872
Sept. 14....	F. R. Burfield...	Pine Creek	N.E. 11-22-1-5..	8.7	4.37	1.34	5.87
Sept. 17....	H. C. Ritchie...	Spencer Creek	S.E. 18-26-5-3..	8.0	5.35	0.71	3.79
May 16....	do .....	do .....	do .....	8.5	5.17	0.63	3.26
" 30....	do .....	do .....	do .....	9.0	5.93	0.61	3.34
June 14....	do .....	do .....	do .....	10.	6.20	0.59	3.67
" 27....	do .....	do .....	do .....	10.	6.80	0.54	3.70
July 11....	do .....	do .....	do .....	10.1	11.50	1.31	15.07
" 26....	do .....	do .....	do .....	12.	16.05	1.66	26.63
Aug. 8....	do .....	do .....	do .....	10.5	10.90	1.09	11.91
" 22....	do .....	do .....	do .....	10.5	10.82	1.14	12.31
Sept. 4....	do .....	do .....	do .....	15.5	13.75	1.28	17.57
" 26....	H. R. Cram....	do .....	do .....	15.4	12.8	1.38	17.7
Oct. 11....	do .....	do .....	do .....	10.7	14.8	1.11	16.4
" 24....	H. C. Ritchie...	do .....	do .....	10.8	11.6	1.16	13.4
Nov. 8....	do .....	do .....	do .....	10.9	12.67	1.19	15.11
May 17....	F. R. Burfield...	Spillway on High-wood River	S.W. 17-19-28-4.	10.3	7.05	1.82	10.75
June 4....	do .....	do .....	do .....	8.3	3.72	1.06	3.95
July 3....	do .....	do .....	do .....	30.5	33.3	1.07	35.77
Aug. 17....	do .....	do .....	do .....	23.	7.94	0.72	5.69
Sept. 16....	do .....	do .....	do .....	23.	7.70	0.81	6.26
Oct. 15....	do .....	do .....	do .....	24.	11.52	1.04	11.93
Nov. 9....	do .....	do .....	do .....	dry.			Nil.
" 19....	do .....	do .....	do .....	do			Nil.
Sept. 14....	do .....	Spring Creek	N.W. 29-20-29-4.	9.1	9.03	1.03	9.32
April 20....	H. C. Ritchie...	Upper Hot Springs	Banff				0.0485-

① Measured with a weir.

## LITTLE BOW RIVER DRAINAGE BASIN.

### General Description.

The source of Little Bow River is a spring in the town of High River in section 6, township 19, range 28, west of the 4th, meridian. From here it flows in a southeasterly direction for one hundred miles and empties into Belly River. In the first few miles, the natural flow is dependent entirely on a number of small springs and coulees which are dry most of the year, but later is augmented by the flow from Mosquito Creek, which drains the south and westerly part of the drainage basin.

There is a comparatively large flow in this stream during the spring freshets, but during summer it would, under natural conditions, dry up. There are a large number of ranches and settlers on this stream, and it is very important that there should be a good flow for domestic

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and stock watering purposes. For this reason the provincial government has constructed a canal and diverts water from Highwood River into Little Bow River whenever required.

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Little Bow River drainage basin, in 1912.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
May 30.....	C. Chambers...	McMillan Spring...	N.W. 10-17-1-5..	1.7	0.34	0.26	0.088
July 25.....	F. R. Burfield...	Spring Creek.....	N.E. 10-17-1-5..	①	.....	.....	0.330
Sept. 17.....	do .....	do .....	do .....	①	.....	.....	0.159
Aug. 19.....	do .....	do .....	do .....	①	.....	.....	0.170
Oct. 16.....	do .....	do .....	do .....	①	.....	.....	0.203

## ① Weir measurements.

## MOSQUITO CREEK NEAR NANTON.

This station was established August 1, 1908, by H. C. Ritchie. It is located at a traffic bridge, about four miles from Nanton, on the road from Nanton to Cayley. The bridge is on a road diversion on the N.E.  $\frac{1}{4}$  Sec. 30, Tp. 16, Rge. 28, W. 4th Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed in a stilling box in the left bank a few yards upstream from the bridge. It is referred to two spike heads in the south side of the bridge pier at the right bank of the stream; elevation 11.47.

The channel is straight for about 175 feet below the station, then curves to the left. Above the station the channel curves slightly to the left for about 500 feet, then it turns sharply to the left. The right bank is low near the water's edge but is high a few feet from it. Sand and mud deposit on this bank in high water. The left bank is high and is of solid clay with a few boulders. There is only one channel at low water. The bridge piers divide the stream into three channels at flood stage.

Discharge measurements are made from the bridge at high water and flood stages. The initial point for soundings is the north end of the bridge. The current is very sluggish at the bridge during low water and during this stage discharge measurements are made at wading sections above or below the bridge.

From April 1 to June 4, 1912, no observer was available. After June 4 the gauge was read by Mr. W. Monkman, who lives about 2,000 feet south of the bridge.

## DISCHARGE MEASUREMENTS of Mosquito Creek, near Nanton, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 10.....	N. McL. Sutherland .....	18.0	30.12	0.94	2.96	28.23
May 7.....	A. W. P. Lowrie.....	23.7	24.60	0.53	2.65	12.92
June 4.....	do .....	23.8	22.69	0.28	2.56	6.41
June 28.....	do .....	24.7	23.56	0.28	2.56	6.74
July 25.....	do .....	56.2	45.39	1.68	3.41	76.17
Aug. 6.....	do .....	39.3	44.00	0.74	3.05	32.34
Aug. 26.....	do .....	25.5	34.38	0.36	2.76	12.25
Sept. 17.....	do .....	26.4	25.62	0.45	2.70	11.24
Oct. 5.....	do .....	26.0	22.13	0.51	2.63	10.55
Nov. 4.....	do .....	26.2	31.32	0.56	2.73	17.63

## DAILY GAUGE-HEIGHT AND DISCHARGE of Mosquito Creek, near Nanton, for 1912.

DAY.	June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.77	14.30
2.....	①		2.81	16.20
3.....			2.81	16.20
4.....	2.56	6.50	2.83	17.30
5.....	2.56	6.50	2.78	14.70
6.....	2.56	6.50	2.75	13.30
7.....	2.54	5.90	2.79	15.20
8.....	2.54	5.90	3.21	47.80
9.....	2.52	5.30	3.53	99.80
10.....	2.51	5.00	3.21	47.80
11.....	2.51	5.00	3.11	37.60
12.....	2.51	5.00	2.99	27.50
13.....	2.56	6.50	2.96	25.40
14.....	2.66	9.70	2.99	27.50
15.....	2.96	25.40	3.26	53.80
16.....	3.76	157.00	2.93	23.40
17.....	3.66	129.60	2.90	21.40
18.....	3.16	42.40	2.90	21.40
19.....	2.86	18.90	2.91	22.10
20.....	2.76	13.80	2.93	23.40
21.....	2.76	13.80	2.91	22.10
22.....	2.64	9.00	2.90	21.40
23.....	2.62	8.30	2.95	24.70
24.....	2.60	7.70	2.97	26.10
25.....	2.58	7.10	3.41	76.30
26.....	2.57	6.80	3.31	60.50
27.....	2.56	6.50	3.11	37.60
28.....	2.61	8.00	3.01	29.00
29.....	2.69	7.40	2.97	26.10
30.....	2.69	10.80	2.95	24.70
31.....			2.91	22.10

① No observer was available from April 1 to June 4.

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Mosquito Creek, near Nanton, for 1912.

Day.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.90	21.40	2.78	13.80	2.76	13.80	2.79	15.20
2.....	2.89	20.80	2.76	13.80	2.72	12.00	2.81	16.20
3.....	2.91	22.10	2.75	13.30	2.71	11.60	2.81	16.20
4.....	3.11	37.60	2.75	13.30	2.71	11.60	2.83	17.30
5.....	3.11	37.60	2.78	14.70	2.68	10.40	2.83	17.30
6.....	3.16	42.40	2.79	15.20	2.71	11.60	2.82	16.80
7.....	2.99	27.50	2.79	15.20	2.71	11.60	2.79	15.20
8.....	2.95	24.70	3.25	52.50	2.76	13.80	2.74	12.90
9.....	2.89	20.80	3.24	51.30	2.81	16.20	2.69	10.80
10.....	2.89.	20.80	2.96	25.40	2.86	18.90	2.64	9.00
11.....	2.89	20.80	2.82	16.80	2.91	22.10	2.69	10.80
12.....	2.87	19.50	2.78	14.70	2.86	18.90	2.72	12.00
13.....	2.87	19.50	2.77	14.30	2.88	20.20	2.79	15.20
14.....	2.88	20.20	2.78	14.70	2.85	18.30	2.84	17.90
15.....	2.85	18.30	2.75	13.30	2.81	16.20	2.87	19.50
16.....	2.88	20.20	2.74	12.90	2.79	15.20	.....	.....
17.....	2.91	22.10	2.71	11.60	2.75	13.30	.....	.....
18.....	2.95	18.30	2.71	11.60	2.73	12.50	.....	.....
19.....	2.91	22.10	2.74	12.90	2.71	11.60	.....	.....
20.....	2.84	17.90	2.73	12.50	2.74	12.90	.....	.....
21.....	2.86	18.90	2.71	11.60	2.81	16.20	.....	.....
22.....	2.77	14.30	2.76	13.80	2.83	17.30	.....	.....
23.....	2.76	13.80	2.78	14.70	2.71	11.60	.....	.....
24.....	2.76	13.80	2.80	15.70	2.72	12.00	.....	.....
25.....	2.80	15.70	2.84	17.90	2.73	12.50	.....	.....
26.....	2.78	14.70	2.86	18.90	2.72	12.00	.....	.....
27.....	2.69	10.80	2.86	18.90	2.72	12.00	.....	.....
28.....	2.76	13.80	2.86	18.90	2.76	13.80	.....	.....
29.....	2.81	16.20	2.84	17.90	2.76	13.80	.....	.....
30.....	2.77	14.30	2.78	14.70	2.75	13.30	.....	.....
31.....	2.77	14.30	.....	.....	2.79	15.20	.....	.....

## MONTHLY DISCHARGE of Mosquito Creek, near Nanton, for 1912.

(Drainage area 186 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
June (4-30).....	157.00	5.00	20.00	0.11	0.11	1,071.00
July.....	99.80	13.30	30.80	0.16	0.18	1,894.00
August.....	42.40	10.80	27.00	0.14	0.16	1,660.00
September.....	52.50	11.60	21.30	0.11	0.12	1,267.00
October.....	22.10	11.60	14.30	0.08	0.09	879.00
November (1-15).....	19.50	9.00	14.80	0.08	0.04	440.00
The period.....	.....	.....	.....	.....	0.70	7,211.00

## NANTON CREEK NEAR NANTON.

This station was established August 3, 1908, by P. M. Sauder. It is located at George Topper's farm, near Nanton. It is on the N.W.  $\frac{1}{4}$  Sec. 20, Tp. 16, Rge. 28, W. 4th Mer., and almost directly west of Mr. Topper's stable.

The gauge, which is a plain staff graduated to feet and hundredths, is driven vertically into the bed of the stream at the left bank. It is attached by braces to posts in the bank. The zero (elevation 82.57) is referred to a permanent iron bench mark (assumed elevation 100.00), located on the right bank, 75 feet southeast from the gauge.

This stream follows a very crooked course, but the channel is nearly straight for about 125 feet above and about 75 feet below the gauge. The banks are well defined but not high and may

overflow in excessive floods. They are composed of clay and covered with tough sod. The bed of the stream is composed of gravel, not liable to shift, and free from vegetation.

Discharge measurements are made by wading at or near the gauge. At flood stage discharge measurements may be made at Mr. Topper's bridge, about 1,000 feet downstream from the gauge.

Mr. George Topper read the gauge until June 27, 1912. From June 27 to August 6 no observer was available. Mr. W. Monkman made the observations from August 6 to November 15, 1912.

### DISCHARGE MEASUREMENTS of Nanton Creek, near Nanton, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
April 10.....	N. McL. Sutherland.....	7.50	8.21	1.00	5.59	8.24①
May 7.....	A. W. P. Lowrie.....	7.00	5.38	0.64	5.46	3.45
June 4.....	do.....	7.20	4.60	0.45	5.34	2.09
June 28.....	do.....	7.50	5.10	0.44	5.40	2.22
July 25.....	do.....	10.70	17.56	2.07	6.19	36.33
Aug. 6.....	do.....	7.40	9.06	1.03	6.00	9.32
Aug. 26.....	do.....	9.20	8.87	0.83	5.85	7.31
Sept. 17.....	do.....	7.80	7.66	0.68	5.75	5.20
Oct. 5.....	do.....	9.30	8.44	0.65	5.77	5.45
Nov. 4.....	do.....	8.00	8.28	1.05	5.90	8.71②

① Stream partly covered with ice.

② Ice below section where measurement was made.

### DAILY GAUGE-HEIGHT AND DISCHARGE of Nanton Creek, near Nanton, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	6.31	①	5.59	3.91	5.37	2.14	.....	.....
2.....	6.56	.....	5.65	4.45	5.37	2.14	.....	.....
3.....	6.56	.....	5.65	4.45	5.37	2.14	.....	.....
4.....	6.51	.....	5.65	4.45	5.37	2.14	.....	.....
5.....	6.46	.....	5.55	3.55	5.37	2.14	.....	.....
6.....	6.21	.....	5.50	3.05	5.37	2.14	.....	.....
7.....	6.13	.....	5.50	3.05	5.37	2.14	.....	.....
8.....	6.06	.....	5.50	3.05	5.37	2.14	.....	.....
9.....	5.96	.....	5.50	3.05	5.37	2.14	.....	.....
10.....	5.70	.....	5.50	3.05	5.36	2.07	.....	.....
11.....	5.76	.....	5.50	3.05	5.36	2.07	.....	.....
12.....	5.66	.....	5.50	3.05	5.36	2.07	.....	.....
13.....	5.65	4.45	5.47	2.54	5.36	2.07	.....	.....
14.....	5.60	4.00	5.43	2.56	5.35	2.21	.....	.....
15.....	5.95	8.40	5.43	2.56	6.67	27.02	.....	.....
16.....	5.83	6.67	5.43	2.56	6.82	32.70	.....	.....
17.....	5.70	5.00	5.43	2.56	6.07	10.53	.....	.....
18.....	5.02	4.18	5.43	2.56	5.42	2.49	.....	.....
19.....	5.55	4.18	5.43	2.56	5.39	2.28	.....	.....
20.....	5.50	3.05	5.53	3.29	5.32	1.82	.....	.....
21.....	5.50	3.05	5.60	4.00	5.32	1.82	.....	.....
22.....	5.50	3.05	5.60	4.00	5.32	1.82	.....	.....
23.....	5.50	3.05	5.09	4.89	5.32	1.82	.....	.....
24.....	5.50	3.05	5.67	4.67	5.32	1.82	.....	.....
25.....	5.50	3.05	5.60	4.00	5.32	1.82	6.91	36.32
26.....	5.50	3.05	5.55	3.55	5.32	1.82	.....	.....
27.....	5.50	3.05	5.48	2.91	5.32	1.82	.....	.....
28.....	5.50	3.05	5.48	2.91	②	.....	.....	.....
29.....	5.50	3.05	5.35	2.00	.....	.....	.....	.....
30.....	5.55	3.55	5.32	1.82	.....	.....	.....	.....
31.....	.....	.....	5.32	1.82	.....	.....	.....	.....

①Ice conditions April 1 to 12. Not sufficient data to compute daily discharges.

②No observer available from June 28 to Aug. 5.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Nanton Creek, near Nanton, for 1912.

Day.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			5.83	6.67	5.79	6.12	5.98	8.91
2.....			5.82	6.53	5.80	6.25	6.00	9.25
3.....			5.83	6.67	5.80	6.25	6.00	9.25
4.....			5.82	6.53	5.80	6.25	5.90	7.65
5.....			5.84	6.81	5.77	5.86	5.89	7.51
6.....	6.00	9.25	5.83	6.67	5.70	5.00	5.90	7.65
7.....	6.78	31.14	5.83	6.67	5.70	5.00	5.88	7.37
8.....	6.74	29.62	7.20	50.00	5.10	0.65	5.88	7.37
9.....	6.00	9.25	7.20	50.00	5.12	0.75	5.85	6.95
10.....	6.00	9.25	7.10	45.00	6.09	10.91	5.95	8.40
11.....	5.59	3.91	6.60	24.50	6.07	10.53	5.93	8.10
12.....	5.59	3.91	6.20	13.20	6.05	10.15	5.93	8.10
13.....	5.60	4.00	6.20	13.20	6.05	10.15	5.93	8.10
14.....	5.92	7.95	5.95	8.40	6.04	9.97	5.90	7.65
15.....	5.90	7.65	5.95	8.40	6.05	10.15	6.00	9.25
16.....	5.92	7.95	5.88	7.37	5.99	9.05		
17.....	5.90	7.65	5.90	7.65	5.98	8.91		
18.....	5.89	7.51	5.89	7.51	5.94	8.25		
19.....	5.90	7.65	5.92	7.95	5.97	8.74		
20.....	5.89	7.51	5.92	7.95	5.98	8.91		
21.....	5.78	5.99	5.85	6.95	5.97	8.74		
22.....	5.78	5.99	5.95	8.40	5.97	8.74		
23.....	5.79	6.12	5.97	8.74	5.97	8.74		
24.....	5.94	8.25	5.99	9.09	5.95	8.40		
25.....	5.94	8.25	6.00	9.25	5.95	8.40		
26.....	5.85	6.95	6.00	9.25	5.96	8.57		
27.....	5.85	6.95	6.10	11.10	5.96	8.57		
28.....	5.82	6.53	6.10	11.10	5.96	8.57		
29.....	5.90	7.65	5.80	6.25	5.98	8.91		
30.....	5.92	7.95	5.81	6.39	5.99	9.08		
31.....	5.89	7.51			5.98	8.91		

## MONTHLY DISCHARGE of Nanton Creek, near Nanton, for 1912

(Drainage area 44 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (13-30).....	8.40	3.05	3.94	0.09	0.06	140.7
May.....	4.89	1.82	3.24	0.07	0.08	199.2
June (1-27).....	32.70	1.82	4.42	0.10	0.10	236.7
August (6-31).....	31.14	3.91	8.94	0.12	0.12	461.0
September.....	50.00	6.53	12.81	0.20	0.22	762.3
October.....	10.91	0.65	7.86	0.18	0.21	483.3
November (1-15).....	9.25	6.95	8.77	0.20	0.11	260.9
The period.....					0.90	2,544.1

NOTE.—No records for the month of July.

## OLDMAN RIVER DRAINAGE BASIN.

*General Description.*

Oldman River, one of the principal tributaries of the South Saskatchewan River, is formed in the Livingstone Range of the Rocky Mountains by the junction of four small rivers, viz.: Livingstone, Northwest Branch, West Branch and Racehorse Creek; and flows in a south and easterly direction to near Cowley, where it is joined by the Crowsnest and Southfork rivers. Between Cowley and Kipp, where it empties into the Belly River, the Oldman River is augmented by several creeks, its course being easterly and northerly. It drains the area bounded on the north by the parallel of latitude through  $59^{\circ} 20'$ , on the south by the parallel of latitude through  $49^{\circ} 20'$ , and on the west by the Great Divide, this area being estimated to contain about 2,235 square miles, with topography varying from mountains to rolling prairie.

The bed of the river is of rock and gravel and has a large fall, with consequent swift water interspersed with falls and rapids, but it changes to quicksand and mud after reaching the prairie region where the current is more sluggish.

The flow of this river, draining as it does mountain ranges with peaks extending above the snow line, is subject to great changes, caused by melting snow and heavy summer rains in the mountains. Floods occur regularly in both May and June, the one in June generally rising higher and lasting longer. From this time on, however, the flow is normally steady but gradually decreases until the minimum is reached during January and February.

The precipitation throughout the basin is quite large. Consequently, though the region is almost entirely under cultivation where practicable, there is little need of irrigation. Owing to the depth of the valley and its steep rocky banks, irrigation from this river would be expensive if not impossible, but there are many excellent power sites at its falls and rapids. Up to the present, however, no power has been developed on this river, but investigations with that end in view are being made.

## RILEY DITCH NEAR WILLOWS.

This station was established by C. Chambers, on July 26, 1912. It is located on the S.W.  $\frac{1}{4}$  Sec. 17, Tp. 13, Rge. 2, W. 5th Mer., and is 35 miles west of Staveley.

The gauge, which is a plain staff graduated in feet and inches, is driven into the bed of the ditch, 239 feet from the headgate on Irishman creek. It is referred to a bench mark located on a wooden post on the left bank of the ditch, 28 feet east of the headgate; elevation 8.90 feet above the datum of the gauge.

The channel is straight for 200 feet above and 100 feet below the station. The banks are high and clean and the bed of the ditch is sandy gravel. The current is fairly swift.

Discharge measurements are made by means of a current meter. The initial point for soundings is a post on the left bank near the gauge.

The gauge is read by Mr. D. E. Riley.

## DISCHARGE MEASUREMENTS of Riley Ditch, near Willows, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
July 26.....	C. Chambers.....	5.8	3.66	1.25	0.90	4.59

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DAILY GAUGE-HEIGHT AND DISCHARGE of Riley Ditch, near Willows, for 1912.

DAY.	September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			0.5	1.8
2.....			0.5	1.8
3.....			0.5	1.8
4.....			0.5	1.8
5.....	0.5	1.8	0.5	1.8
6.....	0.5	1.8	0.5	1.8
7.....	0.5	1.8	0.5	1.8
8.....	0.5	1.8	0.55	2.1
9.....	0.5	1.8	0.55	2.1
10.....	0.5	1.8	0.55	2.1
11.....	0.5	1.8	0.55	2.1
12.....	0.5	1.8	0.55	2.1
13.....	0.5	1.8	0.55	2.1
14.....	0.5	1.8	0.55	2.1
15.....	0.5	1.8	0.5	1.8
16.....	0.5	1.8	0.5	1.8
17.....	0.5	1.8	0.5	1.8
18.....	0.5	1.8	0.5	1.8
19.....	0.5	1.8	0.5	1.8
20.....	0.5	1.8	0.5	1.8
21.....	0.5	1.8	0.5	1.8
22.....	0.5	1.8	0.5	1.8
23.....	0.5	1.8		
24.....	0.5	1.8		
25.....	0.5	1.8		
26.....	0.5	1.8		
27.....	0.5	1.8		
28.....	0.5	1.8		
29.....	0.5	1.8		
30.....	0.5	1.8		
31.....				

MONTHLY DISCHARGE of Riley Ditch, near Willows, for 1912.

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.
	Maximum.	Minimum.	Mean.	Total in Acre-feet.
September (5-30).....	1.8	1.8	1.8	93.
October (1-22).....	2.1	1.8	1.9	83.00
The period.....				176.00

FORD'S WEST DITCH NEAR WILLOWS.

This station was established on June 28, 1912, by C. Chambers. It is located on the N. E.  $\frac{1}{4}$  Sec. 26, Tp. 13, Rge. 1, W. 5th Mer. It is about 22 miles west from Stavely, 25 miles southwest from Nanton and one and one half miles from Willows Post Office. It is on the intake ditch from the spring from which the water is obtained.

The gauge is a plain staff, graduated in feet and inches, driven into the bed of the ditch, 178 feet from the headgate. It is referred to a bench mark on a wooden peg on the east side of the ditch; elevation 2.57 feet below the zero of the gauge.

The channel is straight for 100 feet above and 100 feet below the station. Both banks are fairly high and clean. The bed of the ditch is grassy.

Discharge measurements are made by means of either a weir or current meter. The initial point for soundings is a post driven into the left bank.

No gauge readings were sent in during 1912.



## DISCHARGE MEASUREMENTS of Ford's West Ditch, near Willows, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 28.....	C. Chambers.....	2.9	0.66	0.80	0.34	0.53

## FORD'S EAST DITCH NEAR WILLOWS.

This station was established on June 28, 1912, by C. Chambers. It is located on the N. E.  $\frac{1}{4}$  Sec. 25, Tp. 13, Rge. 1, W. 5th Mer., one and one half miles from Willows Post Office. 22 miles west of Stavelly and 25 miles southwest from Nanton.

The gauge is a staff made of 2" x 4" pine, graduated to feet and inches, and driven into the bed of the ditch 750 feet from the headgate. It is referred to a bench mark on a wooden peg driven into the northwest bank of the Ditch; elevation 6.23 feet above the datum of the gauge.

The channel is straight for 400 feet above and 300 feet below the station. The right bank is low and clean and liable to overflow. The left bank is fairly high and clean. The current is fairly swift.

Discharge measurements may be made with either a current meter or a weir. The initial point for soundings is a post on the right bank. As no water was used after the establishment of the station no readings were taken during 1912.

## DISCHARGE MEASUREMENTS of Ford's East Ditch, near Willows, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 28.....	C. Chambers.....	4.1	1.33	0.66	0.60	0.88

## CARMICHAEL DITCH NEAR STAVELY.

This station was established on July 22, 1912, by C. Chambers. It is located on the S. E.  $\frac{1}{4}$  Sec. 34, Tp. 13, Rge. 29, W. 4th Mer., 100 yards south from Willow Creek and about 16 miles from Stavelly.

The gauge, which is a plain staff graduated in feet and inches, is driven into the bed of the ditch 58 feet from the headgate. It is referred to a bench mark on a wooden post, driven into the ground 34 feet south from the gauge; elevation above the datum of the gauge 4.51 feet.

The channel is straight for 58 feet above and 30 feet below the station. Both banks are low and clean. The bed of the ditch is of clay with short grass. The current is sluggish.

The discharge measurements are made by means of a weir near the gauge.

The gauge is read by Mr. John Carmichael, but as the station was not established until after the ditch was out of use for the season no readings were taken during 1912.

## DISCHARGE MEASUREMENTS of Carmichael Ditch, near Stavelly, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
July 22.....	C. Chambers.....				0.25	0.36①
Aug. 27.....	do.....				0.25	0.34①

① Weir measurements.

TROUT CREEK AT LOCKWOOD'S RANCH.

This station was established on July 7, 1911, by A. W. P. Lowrie. It is located on the S.E.  $\frac{1}{4}$  Sec. 33, Tp. 11, Rge. 28, W. 4th Mer., and is about 180 feet from Mr. Lockwood's house.

The gauge, which is a plain staff graduated to feet and hundredths, is fastened to the stump of a tree on the right bank. The zero (elev. 92.19) is referred to a permanent iron bench mark (assumed elev. 100.00), located 75 feet downstream from the gauge.

The channel is straight for eighty feet above and seventy feet below the gauge. The right bank is wooded and may overflow during high water. The left bank is wooded and low. The bed of the channel is stony, and not liable to shift.

Discharge measurements are made by wading, about twenty feet upstream from the gauge. The initial point for soundings is a post on the left bank.

During 1912, the gauge was read by Mr. F. N. Lockwood.

DISCHARGE MEASUREMENTS of Trout Creek at Lockwood's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 12.....	N. McL. Sutherland.....	31.5	24 24	1.32	3.50	32.05
June 6.....	A. W. P. Lowrie.....	34.2	33.65	1.43	3.79	48.26
June 26.....	do.....	35.2	39.74	1.68	4.07	66.84
July 20.....	do.....	34.0	44.59	1.71	4.23	76.60
Aug. 7.....	do.....	32.2	35.73	1.67	3.97	59.60
Aug. 27.....	do.....	30.0	24.20	1.35	3.44	32.60
Sept. 19.....	do.....	27.9	20.86	1.14	3.22	23.79
Oct. 7.....	do.....	27.06	19.53	1.06	3.19	20.66
Nov. 2.....	do.....	28.40	24.04	0.805	3.17	19.36①

①Ice in creek above and below station.

DAILY GAUGE HEIGHT AND DISCHARGE of Trout Creek at Lockwood's Ranch, for 1912.

Day.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			3.98	59.90	3.91	55.50	4.04	63.80
2.....			3.98	59.90	3.91	55.50	4.07	65.80
3.....			3.97	59.30	3.89	54.30	4.05	64.50
4.....			3.98	59.90	3.88	53.70	3.92	56.10
5.....			4.00	61.20	3.87	53.10	3.85	51.90
6.....			4.01	61.90	3.86	52.50	3.85	51.90
7.....			4.07	65.80	3.85	51.90	3.85	51.90
8.....			4.05	64.50	3.82	50.20	4.27	79.80
9.....			4.02	62.50	3.78	47.90	4.24	87.60
10.....			4.05	64.50	3.77	47.30	4.18	73.30
11.....			4.05	64.50	3.75	46.20	4.16	71.90
12.....	3.52	①34.60	4.05	64.50	3.72	44.60	4.13	69.80
13.....	3.47	32.20	4.03	63.20	3.68	42.50	4.16	71.90
14.....	3.47	32.20	4.01	61.90	3.65	40.90	4.25	78.30
15.....	3.46	31.80	3.97	59.30	4.32	83.50	4.19	74.00
16.....	3.47	32.20	3.95	58.00	4.67	112.70	4.26	79.00
17.....	3.51	34.10	3.94	57.40	4.66	111.80	4.23	76.90
18.....	3.57	37.00	3.94	57.40	4.59	105.50	4.18	73.30
19.....	3.57	37.00	3.94	57.40	4.50	97.80	4.20	74.70
20.....	3.58	37.40	3.95	58.00	4.42	91.30	4.23	76.90
21.....	3.57	37.00	4.07	65.80	4.35	85.80	4.20	74.70
22.....	3.66	41.40	4.07	65.80	4.23	76.90	4.15	71.20
23.....	3.78	47.90	4.07	65.80	4.15	71.20	4.07	65.80
24.....	3.77	47.30	4.05	64.50	4.10	67.80	4.16	71.90
25.....	3.79	48.40	4.02	62.50	4.07	65.80	4.25	78.30
26.....	3.87	53.10	3.98	59.90	4.05	64.50	4.25	78.30
27.....	3.86	52.50	3.97	59.30	4.94	139.00	4.15	71.20
28.....	3.91	55.50	3.96	58.60	4.93	138.00	4.06	65.20
29.....	3.93	58.00	3.94	57.40	4.01	61.80	4.03	63.20
30.....	3.98	59.90	3.93	56.80	3.96	58.60	4.00	61.20
31.....			3.92	56.10			3.97	59.30

①No observations previous to this date.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Trout Creek at Lockwood's Ranch, for 1912.

Day.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.00	61.20	3.37	27.80	3.18	20.60	3.19	21.00
2.....	4.11	67.50	3.37	27.80	3.17	20.30	3.17	20.30
3.....	4.07	65.80	3.37	27.80	3.17	20.30	3.17	20.30
4.....	4.09	66.50	3.37	27.80	3.20	21.30	3.15	19.60
5.....	4.11	67.50	3.37	27.80	3.22	22.00	3.07	17.10
6.....	4.03	63.20	3.38	28.30	3.22	22.00	3.18	20.60
7.....	3.98	59.90	3.40	29.10	3.24	22.70	3.32	25.80
8.....	3.94	57.40	3.61	38.90	3.25	23.10	3.32	25.80
9.....	3.92	56.10	3.42	30.00	3.26	23.50	3.18	20.60
10.....	3.92	56.10	3.38	28.30	3.27	23.90	3.25	23.10
11.....	3.91	55.50	3.33	26.20	3.27	23.90	3.42	30.00
12.....	3.77	47.30	3.29	24.60	3.27	23.90	3.32	25.80
13.....	3.65	40.90	3.27	23.90	3.25	23.10	3.17	20.30
14.....	3.62	39.40	3.27	23.90	3.24	22.70	3.12	18.60
15.....	3.69	43.00	3.27	23.90	3.20	21.30	3.10	18.00
16.....	3.81	49.60	3.26	23.50	3.19	21.00		
17.....	3.73	45.10	3.24	22.70	3.18	20.60		
18.....	3.69	43.00	3.23	22.40	3.17	20.30		
19.....	3.60	38.40	3.26	23.50	3.15	19.60		
20.....	3.57	37.00	3.25	23.10	3.17	20.30		
21.....	3.53	35.00	3.23	22.40	3.23	22.40		
22.....	3.45	31.30	3.24	22.70	3.27	23.90		
23.....	3.40	29.10	3.27	23.90	3.30	25.00		
24.....	3.34	26.60	3.29	24.60	3.28	24.20		
25.....	3.31	25.40	3.31	25.40	3.20	21.30		
26.....	3.28	24.20	3.30	25.00	3.13	19.00		
27.....	3.44	30.90	3.27	23.90	3.14	19.30		
28.....	3.40	29.10	3.24	22.70	3.17	20.30		
29.....	3.37	27.80	3.21	21.70	3.10	18.00		
30.....	3.37	27.80	3.20	21.30	3.97	59.30		
31.....	3.37	27.80			3.12	18.60		

## MONTHLY DISCHARGE of Trout Creek at Lockwood's Ranch, for 1912.

(Drainage area 159 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (12-30).....	59.90	31.80	42.65	0.27	0.19	1,607
May.....	65.80	56.10	61.08	0.38	0.44	3,762
June.....	139.00	40.90	70.94	0.45	0.50	4,221
July.....	79.80	51.90	69.47	0.44	0.51	4,272
August.....	67.50	24.20	44.37	0.28	0.32	2,728
September.....	38.90	21.30	25.50	0.16	0.18	1,517
October.....	23.90	18.00	22.83	0.14	0.16	1,404
November (1-15).....	25.80	17.10	21.79	0.14	0.08	648
The period.....					2.38	20,159

TROUT CREEK AT STEVENSON'S FARM.

This station was established May 14, 1909, by H. C. Ritchie. It is located at the traffic bridge on the road allowance east of the S.E.  $\frac{1}{4}$  Sec. 12, Tp. 12, Rge. 28, W. 4th Mer., and is about seven miles southwest of Claresholm.

The gauge, which is a plain staff graduated to feet and hundredths, is fastened to the left abutment of the bridge. It is referred to a bench mark on top of the outer, downstream pile of the same abutment; elevation 7.99 feet above the zero of the gauge.

The channel is straight for 60 feet above and 50 feet below the station. Both banks are low, wooded, and liable to overflow during high water. The bed of the stream is sand and gravel. The current is fairly swift.

Discharge measurements are made from the bridge during high water, the initial point for soundings being on line with the inner face of the left abutment. During low water the stream is waded at the same section.

From April 1 to June 10, 1912, the gauge was read by Mr. John Stevenson. The station was abandoned after June 10th.

DISCHARGE MEASUREMENTS of Trout Creek at Stevenson's Farm, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 12.....	N. McL. Sutherland.....	28.5	24.82	1.35	1.32	33.44
May 9.....	A. W. P. Lowrie.....	28.3	36.73	1.96	1.65	72.00

DAILY GAUGE-HEIGHT AND DISCHARGE of Trout Creek at Stevenson's Farm, for 1912.

DAY.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.50	50	1.58 ①	56	1.60 ①	58
2.....	1.60 ①	50	1.58	56	1.60 ①	58
3.....	1.45	46	1.60 ①	58	1.60	58
4.....	1.45 ①	46	1.60	58	1.54	53
5.....	1.45 ①	46	1.60 ①	58	1.54	53
6.....	1.41	42	1.60	58	1.54 ①	53
7.....	1.40 ①	41	1.60 ①	58	1.48	48
8.....	1.36	38	1.62	60	1.43	44
9.....	1.35 ①	38	1.62 ①	60	1.43 ①	44
10.....	1.35 ①	38	1.62 ①	60	1.42	43
11.....	1.35 ①	38	1.63	60	①	.....
12.....	1.33	36	1.63 ①	60	.....	.....
13.....	1.30	34	1.64	61	.....	.....
14.....	1.25 ①	30	1.64 ①	61	.....	.....
15.....	1.22	28	1.64	61	.....	.....
16.....	1.25 ①	30	1.63 ①	60	.....	.....
17.....	1.33	36	1.62	60	.....	.....
18.....	1.33 ①	36	1.59	57	.....	.....
19.....	1.33 ①	36	1.60 ①	58	.....	.....
20.....	1.33	36	1.65	62	.....	.....
21.....	1.40 ①	41	1.69	66	.....	.....
22.....	1.40 ①	41	1.69 ①	66	.....	.....
23.....	1.45	46	1.65 ①	62	.....	.....
24.....	1.50 ①	50	1.60	58	.....	.....
25.....	1.50 ①	50	1.60 ①	58	.....	.....
26.....	1.50 ①	50	1.60 ①	58	.....	.....
27.....	1.54	53	1.65	62	.....	.....
28.....	1.54 ①	53	1.65 ①	62	.....	.....
29.....	1.53	52	1.65	62	.....	.....
30.....	1.60	58	1.65	62	.....	.....
31.....	.....	.....	1.60	58	.....	.....

① Gauge heights interpolated.

② Observations were discontinued on June 10.

## MONTHLY DISCHARGE of Trout Creek at Stevenson's Farm, for 1912.

(Drainage area 168 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	58	28	42.3	0.252	0.28	2,517
May.....	66	56	59.9	0.356	0.41	3,683
June (1-10).....	58	43	51.2	0.305	0.11	1,016
The period.....					0.80	7,216

## MUDDYPOUND CREEK AT HART'S RANCH.

This station was established July 27, 1908, by H. C. Ritchie. It is located at the footbridge on L. O. Hart's ranch on the S.W.  $\frac{1}{4}$  Sec. 27, Tp. 11, Rge. 28, W. 4th Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is placed at the left bank, 15 feet upstream from the bridge. The zero (elev. 90.06) is referred to a permanent iron bench mark (assumed elev. 100.00) 35 feet northeast of the gauge.

The channel is straight for 30 feet above, and 110 feet below the station. Both banks are high, composed of clay, but liable to overflow in extreme floods. The bed is of clean gravel. The current is fairly swift.

Discharge measurements are made from the bridge in high water, the initial point for soundings being marked at the left end of the bridge. In low stages the creek is waded about 100 feet upstream.

During 1912, the gauge was read by Mrs. M. E. Hart.

## DISCHARGE MEASUREMENTS of Muddypound Creek at Hart's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 12.....	N. McL. Sutherland.....	14.5	12.50	0.90	2.42	11.28
May 9.....	A. W. P. Lowrie.....	14.0	11.10	0.81	2.40	8.46
June 6.....	do.....	13.6	8.71	0.64	2.26	5.55
June 26.....	do.....	14.0	9.41	0.67	2.30	6.29
July 21.....	do.....	13.4	9.07	0.70	2.30	6.32
Aug. 7.....	do.....	12.8	8.59	0.59	2.25	5.07
Aug. 27.....	do.....	13.0	7.64	0.44	2.18	3.36
Sept. 18.....	do.....	12.8	7.20	0.32	2.15	2.32
Oct. 7.....	do.....	13.4	7.50	0.32	2.16	2.40
Nov. 2.....	do.....	13.6	8.23	0.39	2.20	3.22

DAILY GAUGE-HEIGHT AND DISCHARGE of Muddypound Creek at Hart's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.76	21.12	2.32	7.80	2.29	6.90	2.50	13.20
2.....	2.76	21.12	2.32	7.80	2.29	6.90	2.60	16.20
3.....	2.71	19.50	2.31	7.50	2.28	6.60	2.50	13.20
4.....	2.61	16.50	2.31	7.50	2.27	6.30	2.35	8.70
5.....	2.61	16.50	2.31	7.50	2.27	6.30	2.35	8.70
6.....	2.62	16.80	2.30	7.20	2.26	6.00	2.40	10.20
7.....	2.62	16.80	2.30	7.20	2.26	6.00	2.40	10.20
8.....	2.62	16.80	2.30	7.20	2.26	6.00	2.80	22.40
9.....	2.61	16.50	2.30	7.20	2.21	4.50	2.70	19.20
10.....	2.61	16.50	2.30	7.20	2.21	4.50	2.55	14.70
11.....	2.71	19.52	2.30	7.20	2.19	4.00	2.45	11.70
12.....	2.42	10.80	2.30	7.20	2.19	4.00	2.40	10.20
13.....	2.38	9.60	2.30	7.20	2.18	3.70	2.35	8.70
14.....	2.36	9.00	2.29	6.90	2.18	3.70	2.30	7.20
15.....	2.36	9.00	2.29	6.90	2.47	12.30	2.25	5.70
16.....	2.46	12.00	2.28	6.60	2.66	18.00	2.30	7.20
17.....	2.56	15.00	2.28	6.60	2.41	10.50	2.30	7.20
18.....	2.41	10.50	2.27	6.30	2.36	9.00	2.30	7.20
19.....	2.36	9.00	2.27	6.30	2.36	9.00	2.30	7.20
20.....	2.36	9.00	2.28	6.60	2.34	8.40	2.35	8.70
21.....	2.36	9.00	2.31	7.50	2.34	8.40	2.40	10.20
22.....	2.36	9.00	2.29	6.90	2.31	7.50	2.28	6.60
23.....	2.36	9.00	2.35	8.70	2.31	7.50	2.31	7.50
24.....	2.36	9.00	2.29	6.90	2.31	7.50	2.38	9.60
25.....	2.41	10.50	2.29	6.90	2.31	7.50	2.40	10.20
26.....	2.38	9.60	2.29	6.90	2.34	8.40	2.38	9.60
27.....	2.36	9.00	2.29	6.90	2.29	6.90	2.30	7.20
28.....	2.36	9.00	2.29	6.90	2.30	7.20	2.28	6.60
29.....	2.34	8.40	2.29	6.90	2.60	16.20	2.23	5.10
30.....	2.34	8.40	2.29	6.90	2.55	14.70	2.20	4.25
31.....			2.29	6.90			2.20	4.25

DAILY GAUGE-HEIGHT AND DISCHARGE of Muddypound Creek at Hart's Ranch, for 1912.  
*Concluded.*

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2 18	3 70	2 15	2 80	2 17	3 40	2 23	5 10
2.....	2 18	3 70	2 15	2 80	2 17	3 40	2 20	4 25
3.....	2 21	4 50	2 14	2 60	2 17	3 40	2 22	4 80
4.....	2 40	10 20	2 16	3 10	2 17	3 40	2 22	4 80
5.....	2 40	10 20	2 16	3 10	2 17	3 40	2 22	4 80
6.....	2 30	7 20	2 17	3 40	2 17	3 40	2 20	4 25
7.....	2 35	8 70	2 20	4 25	2 17	3 40	2 20	4 25
8.....	2 40	10 20	2 19	4 00	2 20	4 25	2 20	4 25
9.....	2 36	9 00	2 19	4 00	2 28	6 60	2 20	4 25
10.....	2 33	8 10	2 16	3 10	2 27	6 30	2 20	4 25
11.....	2 30	7 20	2 16	3 10	2 26	6 00	2 20	4 25
12.....	2 28	6 60	2 16	3 10	2 25	5 70	2 25	5 70
13.....	2 25	5 70	2 17	3 40	2 20	4 25	2 20	4 25
14.....	2 25	5 70	2 18	3 70	2 18	3 70	2 20	4 25
15.....	2 23	5 10	2 18	3 70	2 16	3 10	2 25	5 70
16.....	2 23	5 10	2 17	3 40	2 16	3 10	2 23	5 10
17.....	2 21	4 50	2 16	3 10	2 13	2 30	.....	.....
18.....	2 20	4 25	2 16	3 10	2 10	1 55	.....	.....
19.....	2 20	4 25	2 16	3 10	2 08	1 25	.....	.....
20.....	2 20	4 25	2 16	3 10	2 05	0 80	.....	.....
21.....	2 19	4 00	2 16	3 10	2 03	0 68	.....	.....
22.....	2 19	4 00	2 20	4 25	2 03	0 68	.....	.....
23.....	2 18	3 70	2 25	5 70	2 03	0 68	.....	.....
24.....	2 18	3 70	2 30	7 20	2 02	0 62	.....	.....
25.....	2 18	3 70	2 28	6 60	2 02	0 62	.....	.....
26.....	2 18	3 70	2 26	6 00	2 02	0 62	.....	.....
27.....	2 18	3 70	2 26	6 00	2 02	0 62	.....	.....
28.....	2 17	3 40	2 25	5 70	2 10	1 55	.....	.....
29.....	2 17	3 40	2 25	5 70	2 15	2 80	.....	.....
30.....	2 17	3 40	2 25	5 70	2 18	3 70	.....	.....
31.....	2 16	3 10	.....	.....	2 23	5 10	.....	.....

## MONTHLY DISCHARGE of Muddypound Creek at Hart's Ranch, for 1912.

(Drainage area 43 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	21 12	8 40	12 75	0 296	0 33	759
May.....	8 70	6 30	7 10	0 165	0 19	437
June.....	18 00	3 70	7 81	0 182	0 20	465
July.....	22 40	4 25	9 80	0 228	0 26	603
August.....	10 20	3 10	5 42	0 126	0 15	333
September.....	7 20	2 60	4 06	0 094	0 10	242
October.....	6 60	0 62	2 92	0 068	0 08	180
November.....	5 70	4 25	4 65	0 108	0 06	147
The period.....	.....	.....	.....	.....	1 37	3,166

## WILLOW CREEK NEAR MACLEOD.

This station was established July 1, 1909, by H. C. Ritchie. It is located at the traffic bridge on the S.E.  $\frac{1}{4}$  Sec. 26, T.p. 9, Rge. 26, W. 4th Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is located about 300 yards upstream from the bridge and near Mr. McLean's stable. It is driven into the bed of the creek and fixed to the bank with braces. The zero of the gauge (elevation 90.84) is referred to a permanent iron bench mark (assumed elevation 100.00), located 39 feet northeast of the gauge and 160 feet southwest from the corner of Mr. McLean's stable.

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The channel is straight for about 600 feet above and below the station. The right bank is high and wooded. The left bank is low, wooded, and liable to overflow in high water stages. The bed of the stream is of clean gravel. The slope is uniform and the current swift.

Discharge measurements are made from the bridge during high stages, the initial point for soundings being marked on the downstream handrail on a line with the face of the north abutment. During low stages the river is waded at the same section and when very low at the gauge.

During 1912, the gauge was read daily by Mr. Jas. R. McLean.

DISCHARGE MEASUREMENTS of Willow Creek, near Macleod, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 20.....	N. McL. Sutherland . . .	97.0	134.97	1.83	3.03	247.57
May 11.....	A. W. P. Lowrie . . . . .	103.5	178.46	1.91	3.32	340.59
May 31.....	do . . . . .	97.9	158.62	1.78	3.10	282.10
June 25.....	do . . . . .	98.6	166.45	1.94	3.30	322.81
July 19.....	do . . . . .	99.0	190.60	2.12	3.53	413.69
Aug. 5.....	do . . . . .	99.4	257.43	2.49	4.08	618.93
Aug. 23.....	do . . . . .	76.5	130.50	1.32	2.70	171.60
Sept. 14.....	do . . . . .	66.0	106.10	1.10	2.37	116.57
Oct. 4.....	do . . . . .	63.0	98.70	1.08	2.28	106.50
Oct. 24.....	do . . . . .	69.3	110.82	1.17	2.47	129.86
Nov. 19.....	do . . . . .	71.7	111.94	1.21	2.54	134.78

DAILY GAUGE-HEIGHT AND DISCHARGE of Willow Creek near Macleod, for 1912.

	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	①		3.15	282.0	3.08	261.0	3.25	314.0
2.....			3.10	267.0	3.02	244.0	3.25	314.0
3.....			3.08	261.0	3.00	238.0	3.50	398.0
4.....			3.05	252.0	2.95	225.0	3.50	398.0
5.....			3.00	238.0	2.90	212.0	3.30	330.0
6.....			3.00	238.0	2.85	200.0	3.25	314.0
7.....			3.00	238.0	2.83	195.0	3.20	298.0
8.....			3.05	252.0	2.78	183.0	3.50	398.0
9.....			3.05	252.0	2.70	165.0	3.85	524.0
10.....			3.10	267.0	2.65	155.0	4.10	620.0
11.....			3.20	298.0	2.63	151.0	3.95	562.0
12.....			3.25	314.0	2.60	146.0	3.80	506.0
13.....			3.23	308.0	2.55	138.0	3.75	488.0
14.....			3.20	298.0	2.53	134.0	3.70	470.0
15.....			3.18	292.0	2.70	165.0	3.90	543.0
16.....			3.18	292.0	② 6.00	1360.0	3.68	463.0
17.....			3.19	295.0	5.20	1060.0	3.50	398.0
18.....			3.22	304.0	4.90	940.0	3.50	398.0
19.....			3.25	314.0	4.63	832.0	3.45	381.0
20.....	3.03	246.0	3.36	350.0	4.20	660.0	3.38	357.0
21.....	3.00	238.0	3.45	381.0	4.00	581.0	3.35	347.0
22.....	2.95	225.0	3.48	391.0	3.75	488.0	3.35	347.0
23.....	2.95	225.0	3.50	398.0	3.50	398.0	3.35	347.0
24.....	2.98	233.0	3.48	391.0	3.47	387.0	4.05	600.0
25.....	3.05	252.0	3.45	381.0	3.30	330.0	4.50	780.0
26.....			3.09	264.0	3.43	374.0	4.93	952.0
27.....			3.11	270.0	3.29	327.0	4.52	788.0
28.....			3.15	282.0	3.25	314.0	4.45	760.0
29.....			3.20	298.0	3.23	308.0	4.30	700.0
30.....			3.15	282.0	3.19	285.0	4.15	640.0
31.....			3.15	282.0			3.94	558.0

① Gauge carried out by ice.

② Rise due to heavy rain.



## DAILY GAUGE-HEIGHT AND DISCHARGE of Willow Creek, near Macleod, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3.70	470.0	2.58	143.0	2.29	104.0	2.33	108.0
2	3.00	238.0	2.58	143.0	2.29	104.0	2.30	105.0
3	3.00	238.0	2.58	143.0	2.29	104.0	2.20	95.5
4	4.00	581.0	2.58	143.0	2.29	104.0	2.20	95.5
5	3.87	532.0	2.63	151.0	2.29	104.0	2.47	126.0
6	3.73	481.0	2.63	151.0	2.29	104.0	2.47	126.0
7	3.58	427.0	2.63	151.0	2.29	104.0	2.38	114.0
8	3.46	384.0	2.73	172.0	2.33	108.0	2.38	114.0
9	3.43	374.0	2.93	220.0	2.43	120.0	2.36	112.0
10	3.39	361.0	2.98	233.0	2.57	141.0	2.36	112.0
11	3.33	340.0	2.83	195.0	2.59	144.0	2.43	120.0
12	3.33	340.0	2.65	155.0	2.59	144.0	2.47	126.0
13	3.13	276.0	2.58	143.0	2.58	143.0	2.58	143.0
14	3.13	276.0	2.38	114.0	2.56	139.0	2.37	113.0
15	3.13	276.0	2.38	114.0	2.53	134.0	2.37	113.0
16	3.08	261.0	2.36	112.0	2.51	132.0		
17	3.08	261.0	2.33	108.0	2.49	129.0		
18	3.03	246.0	2.30	105.0	2.49	129.0		
19	3.03	246.0	2.30	105.0	2.48	165.0		
20	2.98	233.0	2.28	103.0	2.47	126.0		
21	2.98	233.0	2.33	108.0	2.45	123.0		
22	2.93	220.0	2.33	108.0	2.42	119.0		
23	2.88	207.0	2.40	116.5	2.40	115.0		
24	2.83	195.0	2.47	126.0	2.39	115.0		
25	2.78	183.0	2.53	134.0	2.39	115.0		
26	2.78	183.0	2.53	134.0	2.38	114.0		
27	2.73	172.0	2.53	134.0	2.37	113.0		
28	2.63	151.0	2.47	126.0	2.37	113.0		
29	2.63	151.0	2.41	118.0	2.35	110.0		
30	2.58	143.0	2.35	110.5	2.35	110.0		
31	2.58	143.0			2.35	110.0		

MONTHLY DISCHARGE of Willow Creek, near Macleod, for 1912.

(Drainage area, 1,005 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (20-30).....	298 0	225 0	255 9	0 25	0 10	5,583
May.....	398 0	238 0	305 0	0 30	0 35	18,754
June.....	1,360 0	134 0	381 4	0 38	0 42	22,695
July.....	952 0	298 0	493 3	0 49	0 56	30,332
August.....	581 0	143 0	284 6	0 28	0 32	17,499
September.....	233 0	103 0	137 3	0 14	0 16	8,168
October.....	165 0	104 0	120 6	0 12	0 14	7,415
November (1-15).....	143 0	95 5	114 9	0 11	0 06	3,418
The period.....					2 11	113,864

OLDMAN RIVER NEAR MACLEOD.

This station was established on July 12, 1912, by H. C. Ritchie. It is located at the traffic bridge on the N.W.  $\frac{1}{4}$  Sec. 10, Tp. 9, Rge. 26, W. 4th Mer.

The gauge is a plain staff, graduated to feet and hundredths, fastened to a crib protecting the pier near the right bank. It is referred to a bench mark on spikes in a wooden bent, 93 feet east of the gauge; elevation 11.96.

The channel is straight for 400 feet above and 1,000 feet below the station. Both banks are low, wooded and liable to overflow in extreme high water. The bed is composed of clean gravel, and shifts during high water stages. The current is swift, especially during high water.

Discharge measurements are made from the bridge, the initial point for soundings being at the north end of the handrail on the downstream side of the bridge.

During 1911 and 1912, the gauge was read by Mrs. Walter Jackson.

DISCHARGE MEASUREMENTS of Oldman River, near Macleod, in 1911-12

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1911.		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 15.....	J. E. Degnan.....	80 0	252 80	2 25	3 19	569 05
May 4.....	do.....	273 5	819 36	3 81	5 56	3,119 37
May 26.....	A. W. P. Lowrie.....	293 0	1,041 57	4 89	5 94	5,096 96
June 13.....	do.....	402 0	1,715 89	5 69	7 60	9,769 70
July 3.....	do.....	260 0	768 11	4 33	5 34	3,325 86
July 19.....	do.....	180 0	401 75	4 14	4 15	1,665 03
Aug. 5.....	do.....	106 6	395 10	4 06	4 10	1,603 42
Aug. 28.....	do.....	104 5	363 63	3 62	3 85	1,314 70
Sept. 19.....	do.....	117 5	492 53	5 46	5 01	2,689 86
Oct. 18.....	N. McL. Sutherland.....	102 0	357 10	3 19	3 77	1,140 86
Dec. 11.....	do.....	102 0	322 70	1 78	3 54	573 65
1912.						
Jan. 19.....	N. McL. Sutherland.....	150 0	191 00	1 93	5 31	368 00
Feb. 1.....	do.....	160 0	220 00	1 79	5 30	394 60
Feb. 14.....	do.....	160 0	221 10	1 64	4 95	363 30
Feb. 26.....	do.....	160 0	206 00	1 28	4 50	264 20
Mar. 14.....	do.....	160 0	189 00	1 19	4 24	224 30
April 15.....	do.....	107 0	445 40	3 61	4 15	1,600 55
May 13.....	A. W. P. Lowrie.....	140 9	588 05	5 11	5 10	3,006 00
June 1.....	do.....	137 6	606 43	5 46	5 25	3,310 01
June 24.....	do.....	118 0	571 70	5 54	5 15	3,167 00
July 18.....	do.....	132 0	584 00	5 25	5 10	3,066 00
Aug. 5.....	do.....	120 8	473 43	4 03	4 46	1,909 82
Aug. 24.....	do.....	98 0	329 00	2 64	3 34	870 16
Sept. 16.....	do.....	95 0	300 55	2 28	3 05	685 48
Oct. 10.....	do.....	95 5	293 90	2 31	3 00	678 30
Oct. 23.....	do.....	95 5	306 00	2 48	3 10	758 20
Nov. 16.....	do.....	97 0	301 80	2 26	3 14	683 90
Dec. 4.....	H. O. Brown.....	92 0	267 30	1 64	2 78	438 40
Dec. 18.....	do.....	85 2	240 09	1 35	2 56	324 60

## DAILY GAUGE-HEIGHT AND DISCHARGE of Oldman River, near Macleod, for 1911.

DAY.	March.		April.		May.		June.	
	Gauge-Height.	Dis-charge.	Gauge-Height.	Dis-charge.	Gauge-Height.	Dis-charge.	Gauge-Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	.....	.....	3.55	1,010	5.25	3,245	8.25	12,170
2.....	.....	.....	3.52	986	5.22	3,188	8.35	12,550
3.....	.....	.....	3.50	970	5.22	3,188	8.55	13,310
4.....	.....	.....	3.42	906	5.45	3,630	8.35	12,550
5.....	.....	.....	3.36	862	5.80	4,400	8.20	11,980
6.....	.....	.....	3.30	820	6.45	6,065	8.16	11,828
7.....	.....	.....	3.25	790	6.35	5,795	7.88	10,764
8.....	.....	.....	3.20	760	6.15	5,270	7.85	10,650
9.....	.....	.....	3.20	760	5.75	4,285	7.80	10,460
10.....	.....	.....	3.30	820	5.65	4,060	7.16	8,238
11.....	.....	.....	3.40	890	5.50	3,730	7.25	8,535
12.....	.....	.....	3.30	820	5.55	3,840	7.53	9,488
13.....	.....	.....	3.25	790	5.65	4,060	7.80	10,460
14.....	.....	.....	3.20	760	5.80	4,400	7.90	10,840
15.....	.....	.....	3.19	754	7.20	8,370	7.65	9,920
16.....	.....	.....	3.17	742	9.40	16,540	7.35	8,865
17.....	.....	.....	3.25	790	8.75	15,070	7.20	8,370
18.....	.....	.....	3.50	970	7.69	10,064	7.02	7,776
19.....	.....	.....	3.90	1,330	7.02	7,776	6.65	6,650
20.....	.....	.....	4.25	1,720	6.10	5,140	6.32	5,714
21.....	.....	.....	4.60	2,180	6.40	5,930	6.14	5,244
22.....	.....	.....	4.80	2,470	6.37	5,849	6.12	5,192
23.....	3.69	1,131	5.20	3,150	6.32	5,714	6.12	5,192
24.....	3.67	1,113	5.40	3,530	6.23	5,478	6.30	5,660
25.....	3.65	1,095	5.41	3,550	6.10	5,140	6.80	7,080
26.....	3.60	1,050	5.85	4,515	5.85	4,515	6.45	6,065
27.....	3.58	1,034	6.05	5,010	5.80	4,400	6.20	5,400
28.....	3.55	1,010	5.60	3,950	5.91	4,664	5.12	3,006
29.....	3.50	970	5.35	3,435	6.10	5,140	5.25	3,245
30.....	3.48	954	5.30	3,340	6.55	6,340	5.40	5,303
31.....	3.65	1,095	.....	.....	7.17	8,271	.....	.....



Looking up the Valley of Racehorse Creek from Oldman River.  
Taken by F. H. Peters.



Looking downstream from "The Gap" on Oldman River where the river passes through  
the Livingstone Range of Mountains. Taken by F. H. Peters.



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DAILY GAUGE-HEIGHT AND DISCHARGE of Oldman River, near Macleod, for 1911.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.45	3,630	3.85	1,280	3.53	994	4.56	2,124	3.20	760	3.55	940
2.....	5.42	3,570	3.89	1,320	3.50	970	4.40	1,910	3.20	760	4.07	1,390
3.....	5.45	3,630	3.89	1,320	3.46	938	4.37	1,871	3.20	760	4.10	1,360
4.....	5.32	3,378	3.89	1,320	4.92	2,664	4.32	1,806	3.20	760	4.15	1,460
5.....	5.25	3,245	4.09	1,529	7.60	9,740	4.29	1,768	3.20	760	4.13	1,280
6.....	5.15	3,060	4.19	1,648	7.50	9,380	4.25	1,720	3.22	772	4.10	1,200
7.....	5.04	2,868	4.25	1,720	7.35	8,865	4.20	1,660	3.25	790	4.07	1,100
8.....	4.15	1,600	5.25	3,245	6.89	7,350	4.15	1,600	3.25	790	4.02	1,000
9.....	4.35	1,845	6.55	6,340	6.70	6,780	4.10	1,540	3.25	790	3.95	900
10.....	4.55	2,110	6.20	5,400	6.55	6,340	4.05	1,485	3.25	790	3.85	800
11.....	4.45	1,975	5.67	4,104	6.50	6,200	4.01	1,441	3.25	790	3.77	700
12.....	4.37	1,871	5.35	3,435	6.45	6,065	3.95	1,380	3.25	790	3.70	640
13.....	4.30	1,780	5.15	3,060	6.28	5,608	3.95	1,380	3.25	790	3.60	550
14.....	4.20	1,660	4.87	2,582	5.90	4,640	3.90	1,330	3.25	790	3.59	520
15.....	4.20	1,660	4.75	2,395	5.75	4,285	3.87	1,300	4.75	2,395	3.56	480
16.....	4.20	1,660	4.53	2,082	5.65	4,060	3.80	1,230	4.85	2,550	3.51	430
17.....	4.19	1,648	4.45	1,975	5.50	3,730	3.77	1,203	5.15	3,060	3.45	380
18.....	4.19	1,648	4.36	1,858	5.30	3,340	3.75	1,185	5.36	3,454	3.39	340
19.....	4.15	1,600	4.29	1,768	5.04	2,868	3.69	1,131	4.50	2,040	3.35	300
20.....	4.13	1,576	4.25	1,720	5.01	2,817	3.64	1,086	4.42	1,936	3.35	280
21.....	4.10	1,540	4.12	1,564	4.99	2,783	3.59	1,042	4.35	1,845	③ 3.55	312
22.....	4.08	1,518	4.05	1,485	4.97	2,749	3.55	1,010	4.29	1,768	3.80	325
23.....	4.06	1,496	4.01	1,441	4.95	2,715	3.51	978	4.19	1,648	4.20	345
24.....	4.03	1,463	3.95	1,380	4.90	2,630	3.48	954	4.15	1,600	4.20	345
25.....	4.00	1,430	3.87	1,300	4.79	2,455	3.45	930	4.10	1,540	4.21	346
26.....	3.95	1,380	3.80	1,230	4.70	2,320	3.40	890	4.05	1,485	4.21	346
27.....	3.85	1,280	3.89	1,320	4.62	2,208	3.36	862	4.03	1,463	4.50	360
28.....	3.83	1,260	3.85	1,280	4.58	2,152	3.25	790	3.92	① 1,350	4.70	370
29.....	3.82	1,250	3.79	1,221	4.55	2,110	3.22	772	3.79	1,200	4.89	380
30.....	3.80	1,230	3.69	1,131	4.51	2,054	3.20	760	3.55	960	5.10	390
31.....	3.82	1,250	3.58	1,034	.....	.....	3.20	760	.....	.....	5.20	395

① Shifting conditions from November 28 to December 21, due to ice.

② Rating curve for ice conditions used after December 21.

③ Rating curve for ice conditions used after December 21.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Oldman River, near Macleod, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	① 5.20	395	5.30	400	4.40	355	3.80	1,230	4.26	1,732	5.54	3,818
2.....	5.20	395	5.27	398	4.59	364	3.88	1,310	4.24	1,708	5.45	3,630
3.....	5.12	391	5.27	398	4.41	356	3.90	1,330	4.24	1,708	5.35	3,435
4.....	5.12	391	5.20	395	4.31	351	3.99	1,420	4.24	1,708	5.30	3,340
5.....	5.07	388	5.12	391	4.30	350	4.00	1,430	4.25	1,720	5.25	3,245
6.....	5.07	388	5.03	386	4.25	348	3.85	1,280	4.27	1,744	5.23	3,207
7.....	5.04	387	5.25	398	4.25	348	3.76	1,194	4.25	1,720	5.15	3,060
8.....	5.02	386	5.17	394	4.35	352	3.63	1,077	4.25	1,720	5.10	2,970
9.....	5.02	386	5.10	390	4.40	355	4.08	1,518	4.89	2,611	5.20	3,150
10.....	5.02	386	5.01	386	4.59	364	4.15	1,600	5.20	3,150	5.20	3,150
11.....	5.01	386	5.00	385	4.60	365	4.30	1,780	5.18	3,114	5.10	2,970
12.....	5.01	386	5.00	385	4.45	358	5.02	2,834	5.15	3,060	5.00	2,800
13.....	5.01	386	4.80	375	4.42	356	4.60	2,180	5.10	2,970	5.00	2,800
14.....	5.10	390	4.25	348	4.22	346	4.40	1,910	5.15	3,060	5.00	2,800
15.....	5.25	398	4.35	352	4.40	355	4.15	1,600	5.20	3,150	5.10	2,970
16.....	5.35	402	4.59	364	4.42	356	4.10	1,540	5.70	4,170	7.90	10,840
17.....	5.37	404	4.75	372	4.45	358	4.18	1,636	6.20	5,400	7.30	8,700
18.....	5.34	402	5.00	385	4.65	368	4.20	1,660	6.20	5,400	6.50	6,200
19.....	5.31	400	5.05	388	4.55	362	4.20	1,660	6.10	5,140	6.25	5,530
20.....	5.29	400	4.75	372	4.60	365	4.18	1,636	6.15	5,270	5.80	4,400
21.....	5.26	398	4.60	365	4.48	359	4.18	1,636	6.20	5,400	5.65	4,060
22.....	5.35	402	4.55	362	④ 4.52	362	4.20	1,660	6.17	5,322	5.55	3,840
23.....	5.38	404	4.85	377	4.58	390	4.22	1,684	6.15	5,270	5.40	3,530
24.....	5.38	404	4.85	377	4.65	860	4.25	1,720	6.10	5,140	5.27	3,283
25.....	5.49	410	4.85	377	5.35	1,840	4.25	1,720	6.40	5,930	5.10	2,970
26.....	5.30	400	4.47	358	5.75	2,790	4.30	1,780	5.90	4,640	5.50	3,730
27.....	5.35	402	4.58	364	5.90	3,440	4.30	1,780	6.10	5,140	4.97	2,749
28.....	5.32	401	4.58	364	6.45	5,140	4.28	1,756	6.10	5,140	4.90	2,630
29.....	5.29	400	4.85	377	4.40	1,710	4.28	1,756	6.10	5,140	4.70	2,320
30.....	5.35	402	.....	.....	3.80	① 1,230	4.28	1,756	5.90	4,640	4.70	2,320
31.....	5.32	401	.....	.....	3.60	1,050	.....	.....	5.70	4,170	.....	.....

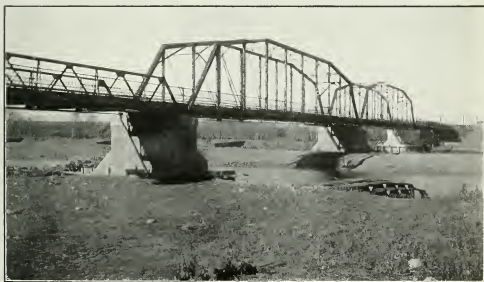
① Rating curve for ice conditions used from January 1 to March 22.

② Shifting conditions from March 22 to March 30.

③ Standard Rating curve used after March 30.



Falls on Crownest River near Lundbreck, Alberta. Taken by H. C. Ritchie.



Traffic Bridge over Oldman River near Macleod used as a Gauging Station.  
Taken by H. C. Ritchie.





SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Oldman River, near Macleod, for 1912.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge	Height.	charge.	Height.	charge	Height.	charge	Height.	charge	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.23	3.207	4.30	1.780	3.20	760	2.90	580	2.95	610	2.52	398
2.....	5.23	3.207	4.30	1.780	3.25	790	2.90	580	2.92	592	3.20	760
3.....	5.40	3.530	4.25	1.720	3.25	790	2.90	580	2.92	592	3.03	658
4.....	5.30	3.340	4.50	2.040	3.25	790	2.92	592	2.92	592	2.85	555
5.....	5.14	3.042	4.30	1.780	3.20	760	2.95	610	2.92	592	2.70	480
6.....	4.90	2.630	4.15	1.600	3.20	760	2.97	622	2.92	592	2.70	480
7.....	4.80	2.470	4.00	1.430	3.20	760	2.98	628	2.92	592	2.75	505
8.....	4.80	2.470	4.00	1.430	3.15	730	2.99	634	2.92	592	2.85	555
9.....	5.25	3.245	4.00	1.430	3.10	700	3.00	640	2.92	592	3.00	640
10.....	5.27	3.283	4.00	1.430	3.10	700	3.00	640	3.20	760	2.90	580
11.....	5.45	3.630	4.00	1.430	3.10	700	2.99	634	3.40	890	2.75	505
12.....	5.33	3.397	3.90	1.350	3.10	700	2.97	622	3.60	1,050	2.75	505
13.....	5.20	3.150	3.80	1.230	3.05	670	2.97	622	3.60	1,050	2.85	555
14.....	5.70	4.170	3.80	1.230	3.05	670	2.97	622	3.60	1,050	2.95	610
15.....	5.60	3.950	3.65	1,095	3.05	670	2.97	622	3.25	790	2.80	530
16.....	5.45	3.630	3.65	1,095	3.05	670	2.97	622	3.14	724	2.75	505
17.....	5.23	3.207	3.50	970	3.00	640	2.97	622	3.14	724	2.70	480
18.....	5.10	2.970	3.50	970	3.00	640	2.98	628	3.13	718	④ 2.50	260
19.....	5.10	2.970	3.50	970	3.00	640	2.99	634	3.10	700	2.50	260
20.....	5.10	2.970	3.60	1,050	3.00	640	3.30	820	3.80	1,230	2.50	260
21.....	5.10	2.970	3.60	1,050	3.00	640	3.70	1,140	3.50	970	2.50	260
22.....	5.10	2.970	3.55	1,010	3.00	640	3.12	712	3.50	970	2.60	265
23.....	5.10	2.970	3.55	1,010	3.15	730	3.15	730	3.50	970	2.70	270
24.....	5.00	2.800	3.50	970	3.13	718	3.15	730	3.40	890	2.75	272
25.....	5.00	2.800	3.50	970	3.10	700	3.14	724	3.00	640	2.97	284
26.....	4.95	2.715	3.40	890	3.80	1,230	3.10	700	2.60	430	3.09	290
27.....	4.90	2.630	3.40	890	3.50	970	3.80	1,230	2.50	390	3.00	285
28.....	4.73	2.365	3.20	760	3.30	820	3.60	1,050	2.40	350	3.00	285
29.....	4.60	2.180	3.20	760	3.09	694	3.20	760	2.40	350	3.15	292
30.....	4.60	2.180	3.20	760	2.99	634	2.99	634	2.50	390	3.20	295
31.....	4.40	1.910	3.20	760	.....	.....	2.97	622	.....	.....	3.25	298

④ Rating curve for ice conditions used after December 18.

## MONTHLY DISCHARGE of Oldman River, near Macleod, for 1911-12.

(Drainage area 2,235 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
March .....	1,131	954	1,051	0.470	0.18	20,846
April .....	5,010	742	1,779	0.796	0.89	105,860
May .....	16,540	3,188	5,921	2.650	3.06	364,069
June .....	13,310	3,006	8,357	3.740	4.17	497,273
July .....	3,630	1,230	1,971	0.882	1.02	121,191
August .....	6,340	1,034	2,080	0.931	1.07	127,890
September .....	9,140	938	4,060	1.820	2.03	241,560
October .....	2,124	160	1,287	0.576	0.66	19,134
November .....	3,454	760	1,372	0.614	0.68	81,640
December .....	1,460	280	644	0.288	0.33	39,398
The period .....					14.09	1,615,891
1912						
January .....	410	386	396	0.177	0.20	24,349
February .....	400	348	319	0.170	0.18	21,800
March .....	5,140	261	845	0.378	0.44	51,957
April .....	2,834	1,077	1,636	0.732	0.82	97,350
May .....	5,400	1,708	3,148	1.68	1.94	230,456
June .....	10,840	2,320	3,815	1.71	1.91	227,010
July .....	4,170	1,910	2,999	1.34	1.54	184,399
August .....	2,040	760	1,214	0.543	0.63	74,644
September .....	1,230	634	732	0.328	0.37	43,557
October .....	1,230	580	696	0.311	0.36	42,795
November .....	1,230	350	713	0.319	0.36	42,426
December .....	760	260	425	0.190	0.22	26,132
The year .....					8.97	1,066,875

## PINCHER CREEK AT PINCHER CREEK.

Under the direction of Arthur O. Wheeler, a regular gauging station was established on Pincher creek at Pincher Creek, in the spring of 1898. On August 13, 1906, J. F. Hamilton replaced the old gauge by a new one. Owing to local improvements the gauge has since been changed but the station remains practically in the same place as established by Mr. Wheeler.

The gauge, which is a plain staff graduated to feet and hundredths, is securely fastened to the breakwater on the right bank, about twenty feet below the traffic bridge. It is referred to bench marks on the north abutment and a low pile underneath the north end of the bridge; elevations 7.75 and 3.40 feet, respectively, above the zero of the gauge.

The channel is straight for about 200 yards above and 300 yards below the bridge. Both banks are high, the right being well cribbed; neither is liable to overflow. The bed is rock and free from vegetation. At the wading section, the channel is straight for about 500 yards above and 70 yards below. Both banks are high, clean and not liable to overflow. The bed is gravel, mixed with heavy gumbo clay.

During high water, discharge measurements are made from the downstream side of the bridge. At low stages, the creek is waded 450 yards upstream.

During 1911, the gauge was read by Mr. P. Bertles, who lives on the north side of the creek. During 1912, the gauge was read by Hugh Bertles.

The town of Pincher Creek has a gravity waterworks system, which diverts water from the creek at a point about three and one quarter miles above the bridge, and the records at this station do not include the water used by the town.

DISCHARGE MEASUREMENTS of Pincher Creek at Pincher Creek, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
April 22.	J. E. Degnan.....	35 50	30 93	2 641	2 04	81 69
May 12.	A. W. P. Lowrie.....	34 50	24 85	2 32	1 91	57 70
June 3.	do.....	45 40	88 86	3 97	2 89	352 90①
June 3.	do.....	76 00	77 30	4 31	2 89	333 30②
June 20.	do.....	40 70	37 32	2 42	2 38	90 32
July 11.	do.....	36 16	21 53	1 82	2 06	39 29
July 27.	do.....	13 80	13 27	1 43	1 89	19 07
Aug 19.	do.....	39 00	24 42	1 61	2 13	39 40
Sept. 2.	do.....	19 00	14 66	1 86	1 99	27 13
Sept. 7.	do.....	81 00	116 05	4 12	3 54	547 77
Oct. 10.	N. McL. Sutherland.....	34 20	40 22	1 70	2 56	68 31
Oct. 30.	do.....	33 00	35 35	1 30	2 44	45 79
1912.						
April 23.	N. McL. Sutherland.....	33 0	35 43	1 75	2 56	62 16
May 17.	A. W. P. Lowrie.....	40 5	40 70	1 91	2 67	77 90
June 13.	do.....	40 2	32 23	1 68	2 49	54 22
July 26.	do.....	35 0	35 71	1 96	2 58	70 15
July 4.	do.....	40 3	33 61	1 85	2 57	65 66
Aug. 14.	do.....	11 1	11 10	1 34	2 12	14 92
Sept. 3.	do.....	31 6	14 68	0 61	2 01	8 94
Sept. 25.	do.....	32 0	17 10	0 79	2 09	13 59
Oct. 15.	do.....	32 5	19 82	0 79	2 15	15 73
Nov. 6.	do.....	30 6	20 40	0 775	2 14	15 80

DAILY GAUGE-HEIGHT AND DISCHARGE of Pincher Creek at Pincher Creek, for 1911.

DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.			1 67	26 0	1 92	60 0	2 89	342 8	2 59	142 2
2.			1 58	17 9	1 87	51 2	3 07	400 4	2 56	133 8
3.			1 54	14 7	1 91	58 0	2 91	349 2	2 54	128 4
4.			1 80	40 0	1 94	64 0	①2 89	324 0	2 49	115 4
5.			1 79	38 8	1 93	62 0	2 76	258 0	2 43	100 6
6.			1 74	33 0	1 97	70 0	2 71	226 0	2 39	91 8
7.			1 76	35 2	1 99	74 0	2 69	208 0	2 35	83 0
8.			1 74	33 0	1 99	74 0	2 78	228 0	2 31	75 0
9.			1 72	31 0	1 98	72 0	2 79	219 0	2 27	67 6
10.			1 91	58 0	1 89	54 4	2 81	212 6	2 24	62 4
11.			1 94	64 0	1 86	49 6	②2 79	205 6	2 19	54 5
12.			1 82	43 2	1 86	49 6	2 79	205 6	2 13	45 9
13.			1 79	38 8	2 27	147 0	2 84	223 4	2 09	40 8
14.			1 70	29 0	2 11	101 4	2 85	227 0	2 06	37 2
15.			1 64	23 1	3 44	518 8	2 80	209 0	2 01	31 2
16.			1 66	25 0	3 49	534 8	2 77	198 8	1 99	28 9
17.			1 66	25 0	3 26	461 2	2 69	172 0	1 99	28 9
18.			1 79	38 8	2 73	291 6	2 65	160 0	1 97	26 7
19.			1 79	38 8	2 70	282 0	2 64	157 0	1 97	26 7
20.	2 01	78 0	1 74	33 0	2 69	278 8	2 59	142 2	1 94	23 6
21.	1 83	44 8	1 79	38 8	2 67	272 4	2 56	133 8	1 89	19 2
22.	1 79	38 8	1 91	58 0	2 91	349 2	2 49	115 4	1 95	24 5
23.	1 75	34 0	2 19	123 4	2 69	278 8	2 43	100 6	1 95	24 5
24.	1 69	28 0	1 86	49 6	2 64	262 8	2 51	120 6	1 89	19 2
25.	1 71	30 0	1 86	49 6	2 59	246 8	3 07	318 8	1 89	19 2
26.	1 69	28 0	1 86	49 6	2 66	269 2	2 77	198 8	1 91	20 9
27.	1 65	24 0	1 85	48 0	2 89	342 8	2 69	172 0	1 89	19 2
28.	1 70	29 0	1 85	48 0	2 94	358 8	2 66	163 0	1 89	19 2
29.	1 78	37 6	1 84	46 4	2 91	349 2	2 63	154 0	1 92	21 8
30.	1 89	54 4	1 84	46 4	2 86	333 2	2 53	125 8	1 93	22 7
31.	1 69	28 0	.....	.....	2 95	362 0	.....	.....	1 91	20 9

① Changing conditions from June 3 to June 10 due to flood.

② Section at gauge altered by flood.

DAILY GAUGE-HEIGHT AND DISCHARGE of Pincher Creek, at Pincher Creek, for 1911.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	1.96	25.6	2.04	34.8	2.79	133.0	2.38	36.2
2.	2.04	34.8	1.99	28.9	2.84	148.8	2.36	33.4
3.	1.99	28.9	1.99	28.9	2.89	165.6	2.36	33.4
4.	1.95	24.5	② 4.49	1060.6	2.89	165.6	2.34	30.8
5.	1.91	20.9	3.89	736.6	2.87	158.8	2.34	30.8
6.	2.19	54.5	3.89	736.6	2.83	145.6	2.33	29.6
7.	3.00	288.0	3.79	④ 682.6	2.80	136.0	2.34	30.8
8.	2.14	47.2	3.62	638.0	2.79	133.0	2.34	30.8
9.	2.09	40.8	3.53	530.0	2.79	133.0	2.36	33.4
10.	2.01	31.2	3.49	504.0	2.77	127.0	2.36	33.4
11.	1.92	21.8	3.40	454.0	2.73	115.0	2.39	37.6
12.	1.86	16.8	3.23	366.0	2.70	106.0	2.39	37.6
13.	2.59	142.2	3.16	326.0	2.65	92.0	2.37	34.8
14.	2.39	91.8	3.19	332.0	2.59	76.8	2.37	34.8
15.	2.46	107.6	3.06	265.0	2.59	76.8	2.39	37.6
16.	2.49	115.4	2.99	230.0	2.63	86.8		
17.	2.45	105.0	2.94	204.0	2.60	79.0		
18.	2.43	100.6	2.89	178.0	2.58	74.6		
19.	2.40	94.0	2.89	164.8	2.58	74.6		
20.	2.39	91.8	2.84	① 150.8	2.57	72.4		
21.	2.33	79.0	2.89	165.6	2.57	72.4		
22.	2.29	71.2	2.89	165.6	2.57	72.4		
23.	2.24	62.4	2.89	165.6	2.55	68.0		
24.	2.19	54.5	2.89	165.6	2.45	47.0		
25.	2.11	43.3	2.89	165.6	2.41	40.6		
26.	2.09	40.8	2.89	165.6	2.41	40.6		
27.	2.09	40.8	2.86	155.4	2.43	43.8		
28.	2.11	43.3	2.86	155.4	2.43	43.8		
29.	2.09	40.8	2.83	145.6	2.42	42.2		
30.	2.09	40.8	2.79	133.0	2.39	37.6		
31.	2.06	37.2			2.48	53.0		

① Rise caused by heavy rains.

② Changing conditions from September 7 to September 19 due to flood.

③ Section at gauge altered by flood.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Pincher Creek at Pincher Creek, for 1912.

DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2 69	80 70	2 48	52 28	2 67	77 90	2 62	70 96
2.....			2 81	98 00	2 49	53 54	2 67	77 90	2 69	80 70
3.....			2 59	66 86	2 54	60 16	2 61	69 58	2 66	76 50
4.....			2 48	52 28	2 54	60 16	2 59	66 86	2 57	64 18
5.....			2 39	41 30	2 49	53 54	2 59	66 86	2 50	54 80
6.....			2 37	38 90	2 49	53 54	2 58	65 52	2 43	46 10
7.....			2 32	32 96	2 51	56 14	2 54	60 16	2 41	43 70
8.....			2 67	77 90	2 57	64 18	2 51	56 14	2 69	80 70
9.....			2 72	84 94	2 63	72 34	2 52	57 48	2 84	102 50
10.....			2 77	92 12	2 59	66 86	2 52	57 48	2 72	84 94
11.....			2 24	24 18	2 59	66 86	2 52	57 48	2 73	86 36
12.....			2 84	102 50	2 59	66 86	2 52	57 48	2 66	76 50
13.....			2 69	80 70	2 59	66 86	2 50	54 80	2 84	102 50
14.....			2 67	77 90	2 59	66 86	2 49	53 54	2 85	104 00
15.....			2 67	77 90	2 59	66 86	2 60	68 20	2 76	90 86
16.....			2 66	76 50	2 67	77 90	2 67	77 90	2 69	80 10
17.....			2 66	76 50	2 67	77 90	2 67	77 90	2 68	79 30
18.....			2 67	77 90	2 67	77 90	2 60	68 20	2 63	72 34
19.....			2 59	66 86	2 69	80 70	2 60	68 20	2 59	66 86
20.....			2 59	66 86	2 07	11 14	2 58	65 52	2 63	72 34
21.....			2 59	66 86	2 17	17 86	2 50	54 80	2 61	69 58
22.....			2 58	65 52	2 07	11 14	2 48	52 28	2 59	66 86
23.....			2 57	64 18	2 04	9 79	2 48	52 28	2 58	65 52
24.....	2 81	98 00	2 57	64 18	2 92	114 50	2 42	44 90	2 59	66 86
25.....	2 95	119 00	2 57	64 18	2 91	113 00	2 40	42 50	2 63	72 34
26.....	2 90	111 50	2 56	62 84	2 91	113 00	2 39	41 30	2 58	65 52
27.....	2 89	110 00	2 56	62 84	2 89	110 00	2 32	32 96	2 51	56 14
28.....	2 93	116 00	2 50	54 80	2 87	107 00	2 32	32 96	2 47	51 02
29.....	2 67	77 90	2 51	56 14	2 79	95 04	2 28	28 40	2 44	47 30
30.....	2 91	113 00	2 50	54 80	2 69	80 70	2 64	73 72	2 39	41 30
31.....	2 68	79 30			2 69	80 70			2 37	38 90

## DAILY GAUGE-HEIGHT AND DISCHARGE of Pincher Creek, at Pincher Creek, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2 32	32 96	2 01	8 62	2 08	11 66	2 26	26 20
2.	2 30	30 60	2 01	8 62	2 07	11 14	2 24	24 18
3.	2 35	36 50	2 01	8 62	2 06	10 62	2 24	24 18
4.	2 32	32 96	2 01	8 62	2 10	12 70	2 22	22 34
5.	2 28	28 40	2 01	8 62	2 12	14 06	2 21	21 42
6.	2 26	26 20	2 01	8 62	2 12	14 06	2 22	22 34
7.	2 25	25 10	2 01	8 62	2 12	14 06	2 24	24 18
8.	2 19	19 62	2 03	9 36	2 19	19 62	2 26	26 20
9.	2 19	19 62	2 02	8 99	2 21	21 42	2 27	27 30
10.	2 17	17 86	2 01	8 62	2 24	24 18	2 27	27 30
11.	2 16	16 98	2 01	8 62	2 27	27 30	2 26	26 20
12.	2 14	15 42	2 00	8 25	2 24	24 18	2 23	23 26
13.	2 12	14 06	2 00	8 25	2 23	23 26	2 23	23 26
14.	2 12	14 06	2 00	8 25	2 21	21 42	2 23	23 26
15.	2 29	29 50	2 00	8 25	2 18	18 74	2 23	23 26
16.	2 27	27 30	2 00	8 25	2 17	17 86		
17.	2 19	19 62	2 00	8 25	2 21	21 42		
18.	2 19	19 62	2 00	8 25	2 20	20 30		
19.	2 14	15 42	2 04	9 73	2 25	25 10		
20.	2 09	12 18	2 06	10 62	2 25	25 10		
21.	2 09	12 18	2 04	9 73	2 24	24 18		
22.	2 05	10 10	2 24	24 18	2 24	24 18		
23.	2 04	9 73	2 25	25 10	2 24	24 18		
24.	2 01	8 62	2 14	15 42	2 24	24 18		
25.	2 09	12 18	2 12	14 06	2 24	24 18		
26.	2 08	11 66	2 12	14 06	2 25	25 10		
27.	2 06	10 62	2 11	13 38	2 25	25 10		
28.	2 04	9 73	2 10	12 70	2 25	25 10		
29.	2 02	8 99	2 09	12 18	2 26	26 20		
30.	2 01	8 62	2 09	12 18	2 27	27 30		
31.	2 01	8 62			2 27	27 30		

## MONTHLY DISCHARGE of Pincher Creek at Pincher Creek, for 1911-1912.

(Drainage area 52 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
March (19-31).....	78 0	24 0	39 7	0 763	0 37	1 024
April.....	123 4	14 7	41 5	0 798	0 89	2 469
May.....	534 8	49 6	215 7	4 20	4 84	13 447
June.....	460 4	100 6	209 0	4 02	4 47	12 436
July.....	142 2	19 2	50 8	0 979	1 13	3 124
August.....	288 0	20 9	65 7	1 26	1 45	4 040
September.....	1060 6	28 9	307 8	5 92	6 60	18 315
October.....	165 6	37 6	92 3	1 75	2 05	5 675
November (1-15).....	37 6	29 6	33 7	0 648	0 36	1 006
The period.....					22 16	61 536
1912						
March (24-31).....	119 00	77 90	103 09	1 98	0 59	1 635
April.....	102 50	24 18	67 00	1 29	1 44	3 987
May.....	114 50	9 79	67 82	1 30	1 50	4 169
June.....	77 90	28 40	58 71	1 13	1 26	3 493
July.....	104 00	38 90	70 24	1 35	1 56	4 318
August.....	36 50	8 62	18 23	0 35	0 40	1 121
September.....	25 10	8 25	10 90	0 21	0 23	649
October.....	27 30	10 62	21 14	0 406	0 47	1 300
November (1-15).....	27 30	21 42	24 32	0 468	0 26	723
The period.....					7 71	21 395

SOUTHFORK RIVER NEAR COWLEY.

This station was established on August 5, 1909, by H. C. Ritchie. It is located at G. W. Buchanan's ranch on the S.W.  $\frac{1}{4}$  Sec. 2, Tp. 7, Rge. 1, W. 5th Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is securely fastened by braces to supports on the right bank, and is about five minutes walk from Mr. Buchanan's house. The zero of the gauge (elevation 92.34) is referred to a permanent iron bench mark (assumed elevation 100.00), located on the left bank of the river, 25 feet southwest from the gauge.

The river flows in one channel, which is slightly curved for some distance above and below the gauge. The left bank is high and will not overflow. The right bank is low and liable to be submerged during the flood stage of the stream. The bed is composed of coarse gravel. The current is moderate.

Discharge measurements are made from the down-stream side of the traffic bridge on the S.E.  $\frac{1}{4}$  Sec. 2, Tp. 7, Rge. 1, W. 5th Mer. The initial point for soundings is marked on the super-structure in line with the face of the abutment on the left bank.

During 1911 and 1912, the gauge was read by Mr. G. W. Buchanan.

DISCHARGE MEASUREMENTS of Southfork River, near Cowley, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
Feb. 20.....	W. H. Greene.....	77.0	88.00	1.01	3.33	89.16
Feb. 27.....	do.....		358.65	0.61	3.51	219.71
Mar. 21.....	J. E. Degnan.....	78.0	157.75	1.353	2.95	212.78
April 7.....	do.....	81.0	161.13	1.19	2.28	191.77
April 27.....	do.....	205.0	415.14	3.82	3.70	1,584.82
June 5.....	do.....	248.0	738.10	5.91	5.10	4,367.76
June 21.....	A. W. P. Lowrie.....	221.8	539.60	4.89	4.15	2,640.76
July 12.....	do.....	181.0	299.35	3.22	3.03	964.94
July 28.....	do.....	100.0	222.05	2.48	2.56	551.69
Aug. 21.....	do.....	108.2	242.58	2.37	2.68	575.49
Sept. 12.....	do.....	235.0	571.85	4.85	4.24	2,776.27
Oct. 11.....	N. McL. Sutherland.....	109.0	234.69	2.39	2.70	561.33
Nov. 4.....	do.....	97.0	173.17	1.90	2.31	329.84
Nov. 30.....	do.....	40.0	111.50	2.01	3.39	224.68
Dec. 14.....	do.....	54.0	111.41	1.71	3.06	190.39
1912.						
Jan. 3.....	N. McL. Sutherland.....	65.0	97.60	1.42	3.24	139.04
Feb. 29.....	do.....	52.0	57.90	1.39	2.34	80.40
Mar. 15.....	do.....	54.0	52.20	1.73	3.13	90.20
Mar. 28.....	do.....	59.2	145.70	1.50	3.21	218.20
April 23.....	do.....	113.5	244.47	3.03	2.73	740.97
May 23.....	A. W. P. Lowrie.....	230.5	517.48	4.28	3.99	2,214.30
June 15.....	do.....	212.0	431.15	3.82	3.64	1,649.31
July 6.....	do.....	157.0	324.25	3.02	3.18	980.00
July 27.....	do.....	144.0	290.05	3.02	3.02	874.54
Aug. 15.....	do.....	100.6	213.91	2.11	2.39	454.95
Sept. 9.....	do.....	94.5	181.40	1.66	2.19	300.30
Sept. 26.....	do.....	94.3	177.03	1.58	2.18	279.46
Oct. 14.....	do.....	95.0	176.20	1.79	2.19	316.24
Nov. 7.....	do.....	94.0	178.60	1.46	2.20	259.20
Nov. 25.....	do.....	37.5	90.40	2.77	2.19	250.20
Dec. 7.....	H. O. Brown.....	50.0	77.62	2.90	3.29	224.80
Dec. 21.....	do.....	34.0	44.75	1.72	2.85	77.14



## DAILY GAUGE-HEIGHT AND DISCHARGE of Southfork River, near Cowley, for 1911.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.43	73	3.30	90	3.62	246	2.40	185	3.47	1,401	4.40	3,050
2.....	2.35	71	3.20	88	3.67	248	2.85	208	3.46	1,388	5.00	4,250
3.....	2.25	69	3.05	85	3.62	246	2.45	188	3.51	1,455	5.40	5,050
4.....	3.57	75	3.45	93	3.67	248	2.38	184	3.70	1,740	5.40	5,050
5.....	3.10	86	3.45	93	3.57	244	2.40	185	3.90	2,080	5.10	4,450
6.....	3.30	90	3.47	93	3.67	248	2.45	188	4.25	2,750	4.70	3,650
7.....	3.15	87	3.45	93	3.72	251	2.28	179	4.10	2,450	4.65	3,550
8.....	3.00	84	3.47	93	3.72	251	2.26	178	4.00	2,260	4.80	3,850
9.....	2.87	81	3.45	93	3.72	251	2.30	180	3.85	1,990	4.70	3,650
10.....	2.70	78	3.45	93	3.65	248	2.34	182	3.75	1,820	4.80	3,850
11.....	2.83	81	3.45	93	3.57	244	2.35	230	3.70	1,740	5.00	4,250
12.....	3.25	89	3.45	93	3.57	244	2.35	280	3.65	1,665	5.30	4,850
13.....	3.35	91	3.45	93	3.62	246	2.28	285	3.80	1,900	5.40	5,050
14.....	3.40	92	3.47	93	3.50	240	2.25	322	3.80	1,900	5.35	4,950
15.....	3.40	92	3.45	93	3.59	245	2.25	322	3.80	1,900	5.30	4,850
16.....	3.40	92	3.45	93	3.52	241	2.35	380	5.65	5,555	5.10	4,450
17.....	3.35	91	3.56	95	3.52	241	2.52	494	4.90	4,050	4.95	4,150
18.....	3.30	91	3.50	94	3.45	238	2.55	515	4.70	3,650	4.70	3,650
19.....	3.25	89	3.52	94	3.32	231	2.68	606	4.50	3,240	4.50	3,250
20.....	3.13	87	3.33	91	3.17	224	2.86	748	4.30	2,830	4.35	2,950
21.....	3.30	100	3.57	95	2.94	212	3.10	970	4.00	2,260	4.15	2,550
22.....	3.25	89	3.52	①130	2.82	206	3.45	1,375	4.00	2,260	4.15	2,550
23.....	3.10	86	3.62	150	2.74	202	3.70	1,740	3.95	2,170	4.10	2,450
24.....	3.20	88	3.56	170	2.72	201	3.80	1,900	3.80	1,900	4.50	3,250
25.....	3.30	90	3.61	200	2.52	191	4.10	2,450	3.70	1,740	4.85	3,950
26.....	3.26	89	3.57	220	2.42	186	3.70	1,740	3.60	1,590	4.50	3,250
27.....	3.20	88	3.51	240	2.45	188	3.70	1,740	3.60	1,590	4.25	2,750
28.....	3.35	91	3.52	241	2.47	188	3.60	1,590	3.60	1,590	4.10	2,450
29.....	3.35	91	.....	.....	2.47	188	3.47	1,401	3.70	1,740	3.95	2,170
30.....	3.30	90	.....	.....	2.47	188	3.43	1,349	4.20	2,650	3.90	2,080
31.....	3.30	90	.....	.....	2.45	188	.....	.....	4.50	3,250	.....	.....

①Shifting conditions from February 22 to February 26.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Southfork River, near Cowley, for 1911.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.85	1,990	2.63	571	2.40	410	2.99	861	2.39	404	3.34	232
2.....	3.70	1,740	2.69	613	2.39	404	2.97	843	2.39	404	3.29	230
3.....	3.60	1,590	2.64	578	2.39	404	2.94	816	2.34	374	3.22	226
4.....	3.55	1,515	2.64	578	5.94	6,130	2.89	772	2.30	350	3.06	218
5.....	3.45	1,375	2.62	564	5.14	4,530	2.84	732	2.27	334	3.09	220
6.....	3.45	1,375	2.68	606	4.84	3,930	2.84	732	2.24	317	3.07	218
7.....	3.35	1,245	3.49	1,427	4.44	3,130	2.79	692	2.24	317	3.09	220
8.....	3.30	1,180	3.69	725	4.39	3,030	2.74	652	5.09	⑤4430	3.09	220
9.....	3.30	1,180	3.59	1,575	4.44	3,130	2.74	652	5.04	4,330	3.04	217
10.....	3.20	1,070	3.49	1,427	4.24	2,730	2.77	676	5.04	⑤4330	2.91	210
11.....	3.04	910	3.39	1,297	4.24	2,730	2.78	684	4.14	2,070	2.54	192
12.....	3.03	900	3.19	1,060	4.24	2,730	2.74	652	4.14	1,620	3.11	220
13.....	2.99	861	2.94	816	4.14	2,530	2.69	613	4.19	1,260	3.14	222
14.....	2.99	861	3.09	960	4.09	2,431	2.64	578	3.83	1,500	2.99	214
15.....	2.99	861	2.99	861	3.89	2,062	2.61	557	4.14	270	3.02	216
16.....	3.02	890	2.88	764	3.64	1,650	2.59	543	4.24	277	3.04	217
17.....	2.97	843	2.79	692	3.49	1,427	2.59	543	4.19	274	2.99	214
18.....	2.94	816	2.74	652	3.44	1,362	2.57	529	4.24	277	3.14	222
19.....	2.89	772	2.69	613	3.34	1,232	2.54	508	4.04	267	2.94	212
20.....	2.84	732	2.64	578	3.24	1,114	2.54	508	3.84	257	3.44	237
21.....	2.74	652	2.68	606	3.24	1,114	2.49	473	3.74	252	3.44	237
22.....	2.69	613	2.64	578	3.19	1,060	2.44	438	3.59	244	3.44	237
23.....	2.74	652	2.58	536	3.19	1,060	2.34	374	3.44	237	3.34	232
24.....	2.64	578	2.54	508	3.19	1,060	2.34	374	3.49	240	3.39	234
25.....	2.62	564	2.54	508	3.19	1,060	2.36	386	3.44	237	3.34	232
26.....	2.59	543	2.54	508	3.19	1,060	2.36	386	3.34	232	3.31	230
27.....	2.54	508	2.59	543	3.16	1,030	2.39	404	3.24	227	3.14	222
28.....	2.56	522	2.49	473	3.16	1,030	2.38	398	3.19	224	3.12	221
29.....	2.49	473	2.44	438	3.04	910	2.36	386	3.27	228	3.14	222
30.....	2.64	578	2.44	438	2.99	861	2.37	392	3.44	237	3.09	220
31.....	2.59	543	2.42	424	.....	.....	2.38	398	.....	.....	3.04	217

① Sudden rise due to ice jams below gauge.

② Shifting conditions from Nov. 8 to Nov. 15.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Southfork River, near Cowley, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	3.19	① 195	3.24	89	2.59	76	2.79	204	2.92	798	3.64	1,650
2.	3.19	160	3.09	86	2.74	79	2.79	301	2.89	772	3.64	1,650
3.	3.24	130	3.11	86	2.89	82	2.79	390	2.84	732	3.62	1,620
4.	3.39	102	2.89	82	2.89	82	2.59	360	2.84	732	3.49	1,427
5.	3.39	102	2.97	83	2.87	81	2.44	350	2.84	732	3.44	1,362
6.	3.34	101	2.89	82	2.99	84	2.42	424	2.84	732	3.44	1,362
7.	3.29	90	2.87	81	3.04	85	2.44	438	2.94	816	3.42	1,336
8.	3.29	90	2.84	81	2.89	82	2.49	473	3.14	1,010	3.89	2,062
9.	3.34	101	2.99	84	2.89	82	2.69	613	3.59	1,575	3.70	1,740
10.	3.34	101	2.97	83	2.94	83	2.89	772	3.64	1,650	3.59	1,575
11.	3.34	101	2.99	84	3.04	85	3.42	1,336	3.59	1,575	3.54	1,500
12.	3.39	102	3.04	85	3.09	86	3.09	960	3.59	1,575	3.64	1,650
13.	3.39	102	2.99	84	3.08	86	2.94	816	3.59	1,575	3.64	1,650
14.	3.49	104	2.89	82	3.14	87	2.81	708	3.69	1,725	3.64	1,650
15.	3.64	107	2.94	83	3.17	87	2.79	692	3.96	2,188	3.59	1,575
16.	3.74	109	2.89	82	3.14	87	2.79	692	4.24	2,730	3.74	1,804
17.	3.79	110	2.89	82	3.14	87	2.79	692	4.24	2,730	3.64	1,650
18.	3.74	109	2.91	82	3.17	87	2.84	732	4.19	2,630	3.64	1,650
19.	3.69	108	2.89	82	3.14	87	2.89	772	4.19	2,630	3.59	1,575
20.	3.67	107	2.87	81	3.14	87	2.84	732	4.19	2,630	3.49	1,427
21.	3.64	107	2.89	82	3.12	86	2.89	772	4.14	2,530	3.44	1,362
22.	3.60	106	2.83	81	3.14	87	2.91	789	4.14	2,530	3.39	1,297
23.	3.58	106	2.64	77	3.22	88	2.91	789	4.09	2,431	3.36	1,258
24.	3.57	105	2.87	81	3.27	89	2.94	816	4.14	2,530	3.34	1,232
25.	3.52	104	2.86	81	3.24	89	2.94	816	4.24	2,730	3.19	1,060
26.	3.44	103	2.89	82	3.29	90	2.94	816	4.14	2,530	3.09	960
27.	3.37	101	2.59	76	3.34	91	2.92	798	4.09	2,431	3.04	910
28.	3.29	90	2.69	78	3.16	87	2.89	772	4.01	2,336	3.09	960
29.	3.24	89	2.34	71	3.09	① 103	2.94	816	3.94	2,152	3.12	990
30.	3.11	86	.....	.....	3.04	190	2.94	816	3.74	1,804	3.19	1,060
31.	3.04	85	.....	.....	2.94	204	.....	.....	3.64	1,650	.....	.....

① Shifting conditions from Jan. 1 to Jan. 4.

② Shifting conditions from March 29 to April 6.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Southfork River, near Cowley, for 1912.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	3.24	1,114	2.89	772	2.19	290	2.09	235	2.24	317	2.24	177
2.	3.34	1,232	2.87	756	2.19	290	2.10	240	2.26	328	2.27	178
3.	3.32	1,206	2.83	724	2.19	290	2.10	240	2.24	317	2.24	177
4.	3.29	1,169	2.79	692	2.19	290	2.12	251	2.19	290	2.24	177
5.	3.24	1,114	2.74	652	2.19	290	2.12	251	2.21	309	2.24	177
6.	3.18	1,050	2.69	613	2.19	290	2.14	262	2.21	300	2.26	178
7.	3.04	910	2.64	578	2.19	290	2.14	262	2.19	290	2.29	180
8.	3.24	1,114	2.59	543	2.19	290	2.16	273	2.19	290	2.34	182
9.	3.44	1,362	2.49	473	2.19	290	2.17	278	2.24	317	2.29	180
10.	3.42	1,336	2.49	473	2.19	290	2.17	278	2.24	317	2.19	174
11.	3.54	1,500	2.49	473	2.19	290	2.19	290	2.34	374	2.19	174
12.	3.54	1,500	2.44	438	2.19	290	2.19	290	2.29	344	2.24	177
13.	3.59	1,575	2.44	438	2.19	290	2.19	290	2.32	362	2.24	177
14.	3.64	1,650	2.39	404	2.19	290	2.18	284	2.33	368	2.24	177
15.	3.49	1,427	2.39	404	2.19	290	2.18	284	2.34	374	2.19	174
16.	3.44	1,362	2.39	404	2.19	290	2.20	295	2.34	374	2.54	① 160
17.	3.39	1,297	2.39	404	2.19	290	2.22	306	2.34	374	2.54	135
18.	3.31	1,232	2.34	374	2.17	278	2.24	317	2.34	374	2.64	110
19.	3.29	1,169	2.34	374	2.17	278	2.27	334	2.34	374	2.74	79
20.	3.29	1,169	2.34	374	2.21	300	2.29	344	2.32	362	2.80	80
21.	3.24	1,114	2.29	345	2.60	550	2.32	362	2.29	344	2.86	81
22.	3.24	1,114	2.24	317	2.17	278	2.34	374	2.29	344	2.89	82
23.	3.24	1,114	2.24	317	2.14	262	2.34	374	2.29	344	2.89	82
24.	3.17	1,040	2.24	317	2.14	262	2.32	362	2.29	344	2.87	81
25.	3.08	950	2.24	317	2.16	273	2.32	362	2.19	290	2.82	80
26.	3.02	890	2.24	317	2.18	284	2.29	344	2.19	② 290	2.89	82
27.	3.02	890	2.22	306	2.16	273	2.29	344	2.24	270	2.92	82
28.	2.99	861	2.22	306	2.14	262	2.29	344	2.24	230	2.92	82
29.	2.94	816	2.19	290	2.09	235	2.24	317	2.24	195	2.64	77
30.	2.94	816	2.19	290	2.09	235	2.26	328	2.29	180	2.74	79
31.	2.89	772	2.19	290			2.25	322			2.79	80

① Shifting conditions from Nov. 26 to Nov. 30.

② Shifting conditions from Dec. 16 to Dec. 20.

## MONTHLY DISCHARGE of Southfork River, near Cowley, for 1911-12..

(Drainage area 374 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
January.....	100	69	86.5	0.237	0.27	5,319
February.....	241	85	118	0.316	0.33	6,553
March.....	251	186	226	0.604	0.70	13,896
April.....	2,450	178	743	1.99	2.22	44,212
May.....	5,555	1,388	2,275	6.08	7.01	139,885
June.....	6,050	2,080	3,675	9.83	10.97	218,680
July.....	1,990	473	933	2.49	2.87	57,368
August.....	1,575	424	726	1.94	2.24	44,640
September.....	6,130	404	1,911	5.11	5.70	113,710
October.....	861	374	566	1.51	1.74	34,802
November.....	4,430	224	867	2.32	2.59	51,590
December.....	237	192	222	0.567	0.65	13,650
The year.....					37.29	744,305
1912						
January.....	195	85	107	0.286	0.33	6,579
February.....	89	71	81.8	0.219	0.24	4,705
March.....	204	76	95.1	0.249	0.29	5,724
April.....	1,336	204	682	1.82	2.03	46,582
May.....	2,730	732	1,845	4.93	5.68	113,445
June.....	2,062	910	1,433	3.83	4.27	85,270
July.....	1,650	772	1,157	3.09	3.56	71,144
August.....	772	290	444	1.19	1.37	27,300
September.....	550	235	290	0.775	0.86	17,256
October.....	374	235	304	0.813	0.94	18,692
November.....	374	180	319	0.853	0.95	18,982
December.....	182	77	133	0.356	0.41	8,178
The year.....					20.93	417,857

## MILL CREEK NEAR MOUNTAIN MILL.

This station was established July 7, 1910, by H. C. Ritchie. It is located on the S.W.  $\frac{1}{4}$  Sec. 18, Tp. 6, Rge. 1, W. 5th Mer., at the site of the abandoned government mill, nine and a half miles west of Pincher Creek Post Office.

The gauge is a plain staff, graduated to feet and hundredths, placed at the left bank. It is referred to a bench mark on a spike at the northeast corner of the mill; elevation 10.97.

The channel is straight for 200 feet above and 300 feet below the station. Both banks are high, clean, rocky and will not overflow. The bed of the stream is of gravel, giving a stable cross section. The current is swift.

Discharge measurements in flood stages are made from the bridge. In normal and low water stages the creek is waded 50 feet upstream from the gauge, the initial point for soundings being a stake on the left bank.

During 1911 and 1912, the gauge was read by Mrs. J. McIlquham.

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DISCHARGE MEASUREMENTS of Mill Creek, near Mountain Mill, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911						
April 21.....	J. E. Degman.....	49.0	42 37	3.211	2.57	136.05
May 11.....	A. W. P. Lowrie.....	45.5	64.36	2.38	2.66	153.32
June 28.....	do.....	65.5	105.17	3.26	2.75	342.74
July 10.....	do.....	46.8	40.01	2.52	2.25	100.98
July 26.....	do.....	36.7	27.95	1.92	2.01	53.66
Aug. 18.....	do.....	48.0	36.92	2.73	2.30	100.85
Sept. 13.....	do.....	68.6	137.29	4.67	3.30	641.78
Oct. 9.....	N. McL. Sutherland.....	40.0	36.25	2.67	2.07	96.71
Nov. 1.....	do.....	35.5	32.76	2.04	1.96	66.78
1912.						
April 22.....	N. McL. Sutherland.....	24.0	39.15	2.33	2.06	91.28
May 18.....	A. W. P. Lowrie.....	69.0	81.36	2.53	2.58	205.52
June 12.....	do.....	50.0	47.70	2.85	2.23	135.87
July 3.....	do.....	51.0	52.17	3.06	2.38	159.55
July 26.....	do.....	48.5	39.80	2.915	2.23	115.03
Aug. 13.....	do.....	37.0	23.53	2.00	1.77	47.04
Sept. 6.....	do.....	35.0	19.20	1.74	1.62	33.42
Sept. 30.....	do.....	35.8	19.79	1.50	1.60	29.69
Oct. 16.....	do.....	37.8	25.09	1.68	1.75	42.21
Nov. 12.....	do.....	38.0	27.15	1.75	1.73	47.60

DAILY GAUGE-HEIGHT AND DISCHARGE of Mill Creek, near Mountain Mill, for 1911.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.20	66.0	2.58	139.0	3.60	967.0	2.75	338.0
2.....	2.20	66.0	2.60	143.0	3.65	1,004.0	2.67	279.4
3.....	2.18	62.6	2.60	143.0	3.60	967.0	2.65	265.0
4.....	2.10	49.0	2.65	153.0	3.40	819.0	2.65	265.0
5.....	2.20	66.0	2.70	164.0	3.00	523.0	2.50	175.0
6.....	2.10	49.0	3.00	234.0	3.00	523.0	2.40	134.0
7.....	2.15	62.6	3.05	247.0	3.00	523.0	2.40	134.0
8.....	2.18	62.6	2.85	197.0	3.05	560.0	2.40	134.0
9.....	2.20	66.0	2.85	197.0	3.10	597.0	2.35	118.0
10.....	2.20	66.0	2.75	175.0	3.10	597.0	2.30	104.0
11.....	2.20	66.0	2.70	164.0	3.40	819.0	2.30	104.0
12.....	2.18	62.6	2.70	164.0	3.22	685.8	2.20	82.0
13.....	2.30	84.0	2.86	199.4	3.15	634.0	2.20	82.0
14.....	2.20	66.0	2.80	186.0	3.15	634.0	2.15	73.0
15.....	2.35	93.5	3.00	234.0	3.10	597.0	2.10	65.0
16.....	2.30	84.0	①4.15	533.0	3.10	597.0	2.10	65.0
17.....	2.35	93.5	②3.50	364.0	2.95	486.0	2.10	65.0
18.....	2.37	97.3	3.31	364.0	2.95	486.0	2.10	65.0
19.....	2.45	113.0	3.15	369.0	2.90	449.0	2.18	78.4
20.....	2.58	139.0	3.10	403.0	2.00	52.0	2.16	74.8
21.....	2.80	186.0	3.10	453.0	2.00	52.0	2.16	74.8
22.....	2.70	164.0	3.50	606.0	2.10	65.0	2.10	65.0
23.....	2.65	153.0	3.00	522.0	2.10	65.0	2.15	73.0
24.....	2.80	186.0	2.82	389.8	2.20	82.0	2.12	68.2
25.....	2.85	197.0	2.80	375.0	2.20	82.0	2.12	68.2
26.....	2.82	190.4	2.75	338.0	2.40	134.0	2.01	53.2
27.....	2.70	164.0	2.65	265.0	2.40	134.0	2.02	54.4
28.....	2.60	143.0	2.65	265.0	2.60	231.0	2.05	58.0
29.....	2.63	149.0	2.75	338.0	2.80	375.0	2.05	58.0
30.....	2.58	139.0	3.40	819.0	2.80	375.0	2.20	82.0
31.....			3.44	848.6			2.30	104.0

① Rise due to heavy rain. Section altered by shifting gravel bars during flood.

② Shifting conditions from May 17 to May 23. New rating curve used after May 23.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Mill Creek, near Mountain Mill, for 1911.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.50	175.0	2.02	54.4	2.25	152.0	2.05	90.0
2.....	3.05	560.0	2.02	54.4	2.30	169.0	2.00	77.0
3.....	2.85	412.0	2.40	134.0	2.25	152.0	1.95	64.0
4.....	2.60	231.0	4.60 <sup>①</sup>	1,707.0	2.20	136.0	1.95	64.0
5.....	2.20	82.0	3.70	1,041.0	2.20	136.0	1.95	64.0
6.....	2.30	104.0	2.80	383.0	2.15	120.0	1.95	64.0
7.....	3.27	722.8	2.90	431.0	2.15	120.0	2.00	77.0
8.....	3.20	671.0	3.40	697.0	2.10	104.0	2.05	90.0
9.....	3.05	560.0	3.40	697.0	2.10	104.0	2.10	104.0
10.....	3.05	560.0	3.30	643.0	2.10	104.0	2.30	169.0
11.....	2.70	301.0	3.39	691.6	2.10	104.0	2.35	187.0
12.....	2.60	231.0	3.35	670.0	2.10	104.0	2.50	246.0
13.....	2.50	175.0	3.30	643.0	2.10	104.0	2.95	456.0
14.....	2.45	153.0	3.20	589.0	2.05	90.0	3.10	535.0
15.....	2.40	134.0	3.15	562.0	2.05	90.0	3.30	643.0
16.....	2.38	127.6	3.10	535.0	2.05	90.0	.....	.....
17.....	2.38	127.6	2.80	383.0	2.05	90.0	.....	.....
18.....	2.30	104.0	2.70	335.0	2.10	104.0	.....	.....
19.....	2.22	86.0	2.60	290.0	2.05	90.0	.....	.....
20.....	2.19	80.2	2.49	241.8	2.05	90.0	.....	.....
21.....	2.22	86.0	2.49	241.8	2.00	77.0	.....	.....
22.....	2.18	78.4	2.50	246.0	2.00	77.0	.....	.....
23.....	2.18	78.4	2.50	246.0	1.95	64.0	.....	.....
24.....	2.16	74.8	2.50	246.0	1.95	64.0	.....	.....
25.....	2.20	82.0	2.50	246.0	1.95	64.0	.....	.....
26.....	2.20	82.0	2.30	169.0	2.00	77.0	.....	.....
27.....	2.20	82.0	2.30	169.0	2.00	77.0	.....	.....
28.....	2.10	65.0	2.30	169.0	2.00	77.0	.....	.....
29.....	2.00	52.0	2.30	169.0	2.00	77.0	.....	.....
30.....	2.00	52.0	2.20	136.0	2.00	77.0	.....	.....
31.....	2.00	52.0	.....	.....	2.05	90.0	.....	.....

① Rise due to heavy rain and snow.

② Section changed by flood. New rating table used after Sept. 6.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Mill Creek, near Mountain Mill, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge-Height.	Dis-charge.	Gauge-Height.	Dis-charge.	Gauge-Height.	Dis-charge.	Gauge-Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	0.50	5.90	2.00	80	2.42	168	2.43	171
2.....	0.51	5.94	2.01	82	2.42	168	2.38	158
3.....	0.51	5.94	2.01	82	2.40	163	2.35	151
4.....	0.55	6.10	1.98	77	2.40	163	2.30	139
5.....	0.53	6.02	2.02	84	2.38	158	2.23	124
6.....	0.58	6.40	2.01	82	2.33	146	2.13	103
7.....	0.78	8.76	2.01	82	2.32	144	2.08	94
8.....	0.78	8.76	2.13	103	2.30	139	2.33	146
9.....	1.08	12.36	2.43	171	2.30	139	2.53	198
10.....	1.23	15.40	2.38	158	2.29	137	2.53	198
11.....	2.43	171	2.33	146	2.25	128	2.51	193
12.....	2.33	146	2.32	144	2.23	124	2.53	198
13.....	2.18	113	2.33	146	2.25	128	2.58	213
14.....	2.03	85	2.49	187	2.25	128	2.53	198
15.....	2.03	85	2.53	198	2.27	132	2.53	198
16.....	2.11	100	2.63	229	2.33	146	2.57	210
17.....	2.08	94	2.58	213	2.32	144	2.51	193
18.....	2.06	91	2.58	213	2.30	139	2.38	158
19.....	2.10	98	2.71	256	2.28	135	2.38	158
20.....	2.05	89	2.85	310	2.28	135	2.43	171
21.....	2.04	87	3.03	407	2.23	124	2.33	146
22.....	2.06	91	3.03	407	2.23	124	2.31	141
23.....	2.06	91	3.01	394	2.15	107	2.31	141
24.....	2.08	94	2.88	323	2.13	103	2.32	144
25.....	2.08	94	2.95	359	2.11	100	2.31	141
26.....	2.08	94	2.89	328	2.08	94	2.23	124
27.....	2.07	93	2.89	328	2.03	85	2.18	113
28.....	2.01	82	2.82	298	1.95	72	2.15	107
29.....	2.05	89	2.63	229	1.95	72	2.10	98
30.....	2.03	86	2.53	198	2.33	146	2.05	89
31.....	.....	.....	2.43	171	.....	.....	2.05	89



## DAILY GAUGE-HEIGHT AND DISCHARGE of Mill Creek, near Mountain Mill, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge.	Dis-	Gauge.	Dis-	Gauge.	Dis-	Gauge.	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2.03	86	1.63	33	1.63	33	1.89	63
2.	2.03	86	1.63	33	1.65	35	1.90	64
3.	1.91	66	1.63	33	1.67	37	1.89	63
4.	1.91	66	1.62	33	1.68	38	1.87	60
5.	1.89	63	1.61	32	1.68	38	1.84	56
6.	1.89	63	1.61	32	1.68	38	1.81	52
7.	1.88	61	1.61	32	1.67	37	1.78	48
8.	1.88	61	1.60	31	1.66	36	1.76	46
9.	1.85	57	1.60	31	1.66	36	1.75	45
10.	1.85	57	1.59	30	1.68	38	1.75	45
11.	1.81	52	1.59	30	1.69	39	1.74	44
12.	1.78	48	1.58	30	1.69	39	1.73	43
13.	1.77	47	1.58	30	1.71	41	1.78	48
14.	1.75	45	1.60	31	1.71	41	1.81	52
15.	1.73	43	1.59	30	1.72	42	1.83	54
16.	1.73	43	1.59	30	1.73	43	1.85	57
17.	1.73	43	1.61	32	1.73	43		
18.	1.73	43	1.59	30	1.73	43		
19.	1.70	40	1.60	31	1.75	45		
20.	1.68	38	1.59	30	1.74	44		
21.	1.65	37	1.59	30	1.74	44		
22.	1.66	36	1.59	30	1.73	43		
23.	1.66	36	1.60	31	1.73	43		
24.	1.66	36	1.61	32	1.74	44		
25.	1.68	38	1.62	33	1.74	44		
26.	1.69	39	1.62	33	1.73	43		
27.	1.69	39	1.61	32	1.74	44		
28.	1.68	38	1.61	32	1.78	48		
29.	1.65	35	1.62	33	1.79	49		
30.	1.65	35	1.62	33	1.83	54		
31.	1.64	34			1.86	58		

## MONTHLY DISCHARGE of Mill Creek, near Mountain Mill, for 1911-12.

(Drainage area 64 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
April.	197.0	49.0	106.2	1.66	1.85	6,319
May.	848.6	139.0	322.3	5.04	5.81	19,817
June.	1,004.0	52.0	470.5	7.35	8.20	27,996
July.	338.0	53.2	111.6	1.74	2.01	6,862
August.	722.8	52.0	205.8	3.22	3.71	12,654
September.	1,707.0	54.4	427.3	6.67	7.44	25,426
October.	169.0	64.0	99.2	1.55	1.79	6,100
November (1-15).	643.0	64.0	195.3	3.05	1.70	5,802
December.						
The period.					32.51	110,976
1912						
April.	171.0	5.9	68.49	1.07	1.19	4,075
May.	407.0	77.0	209.20	3.27	3.77	12,863
June.	168.0	72.0	129.70	2.03	2.26	7,718
July.	210.0	89.0	151.80	2.37	2.73	9,334
August.	86.0	34.0	48.70	0.76	0.88	2,994
September.	33.0	30.0	31.40	0.49	0.55	1,868
October.	58.0	33.0	41.90	0.65	0.75	2,576
November (1-15).	64.0	43.0	52.50	0.82	0.49	1,666
The period.					12.62	43,094

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CANYON CREEK NEAR MOUNTAIN MILL.

This station was established July 6, 1910, by H. C. Ritchie. It is located on the N. E.  $\frac{1}{4}$  Sec. 14, Tp. 6, Rge. 2, W. 5th Mer., near G. Biron's ranche.

The gauge, which is a plain staff graduated to feet and hundredths, is placed at the left bank within 75 feet of Mr. Biron's corral. It is referred to a bench mark on a spike in are tree within fifteen feet; elevation 14.49.

The channel is straight for 150 feet above and 30 feet below the station. Both banks are high, wooded, and will not overflow. The bed of the stream is of clean gravel and rock. The current is very swift and turbulent. On this account discharge measurements are made about one half mile upstream at the traffic bridge on the road allowance to the Beaver coal mines.

Discharge measurements are made from the bridge during high water stages, the initial point for soundings being on a line with the face of the left abutment. At ordinary stages the stream is waded about 100 yards downstream, the initial point for soundings being marked by a hub on the left bank.

During 1911 and 1912, the gauge was read by Mr. G. Biron.

DISCHARGE MEASUREMENTS of Canyon Creek, near Mountain Mill, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
April 21 . . . . .	J. E. Degnan . . . . .	18 0	28.59	1.913	5.19	54 68
May 11 . . . . .	A. W. P. Lowrie . . . . .	18 5	19.78	1.88	4.90	37 28
June 28 . . . . .	do . . . . .	18 2	16.52	1.88	4.84	30 08
July 10 . . . . .	do . . . . .	17 5	10.20	1.07	4.47	10.98
July 26 . . . . .	do . . . . .	17 0	8.09	0.93	4.29	7 59
Aug. 18 . . . . .	do . . . . .	17 8	8.94	1.00	4.42	8 93
Sept. 13 . . . . .	do . . . . .	18 4	33.59	2.78	5.42	93 51
Oct. 9 . . . . .	N. McL. Sutherland . . . . .	18.8	14.87	1.70	4.77	25.22
Nov. 1 . . . . .	do . . . . .	18.0	13.89	1.12	4.64	15.60
1912.						
April 22 . . . . .	N. McL. Sutherland . . . . .	18.0	21.97	2.18	5.02	47.09
May 18 . . . . .	A. W. P. Lowrie . . . . .	13.9	12.42	1.78	4.66	22.13
June 12 . . . . .	do . . . . .	17.5	9.60	1.39	4.52	13.32
July 3 . . . . .	do . . . . .	18.3	10.42	1.63	4.64	17.02
July 26 . . . . .	do . . . . .	17.6	10.38	1.35	4.52	14.09
Aug. 13 . . . . .	do . . . . .	17.2	7.33	0.80	4.28	5.89
Sept. 6 . . . . .	do . . . . .	17.3	6.87	0.50	4.17	3.47
Sept. 30 . . . . .	do . . . . .	17.5	6.88	0.51	4.21	3.50
Oct. 16 . . . . .	do . . . . .	17.3	7.14	0.51	4.22	3.67
Nov. 12 . . . . .	do . . . . .	17.5	9.20	0.55	4.26	5.09

## DAILY GAUGE-HEIGHT AND DISCHARGE Canyon Creek, near Mountain Mill, for 1911.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1 . . . . .	①		5.06	52	5.82	142	4.75	23.8
2 . . . . .			5.06	52	5.67	124	4.70	20.5
3 . . . . .			5.04	50	5.52	106	4.66	18.1
4 . . . . .			5.11	58	5.32	82	4.64	17.0
5 . . . . .			5.12	59	5.25	74	4.60	15.0
6 . . . . .			5.15	62	5.22	70	4.58	14.2
7 . . . . .			5.12	59	5.27	76	4.54	12.5
8 . . . . .			5.02	48	5.17	64	4.52	11.8
9 . . . . .			4.96	42	5.12	59	4.50	11.0
10 . . . . .	4 46	9.8	4.93	39	5.07	53	4.49	10.7
11 . . . . .	4 52	11.8	4.88	34	5.07	53	4.46	9.8
12 . . . . .	4 53	12.1	4.87	33	5.02	48	4.46	9.8
13 . . . . .	4 55	12.9	4.97	43	4.97	43	4.44	9.2
14 . . . . .	4 46	9.8	5.16	63	5.02	48	4.43	8.9
15 . . . . .	4 47	10.1	5.50	104	4.95	41	4.41	8.3
16 . . . . .	4 56	13.3	6.82	262	4.92	38	4.38	7.4
17 . . . . .	4 72	22	6.12	178	4.86	32	4.37	7.1
18 . . . . .	4 86	32	5.82	142	4.82	29	4.36	6.8
19 . . . . .	4 94	40	5.52	106	4.72	22	4.38	7.4
20 . . . . .	5 02	48	5.42	94	4.71	21	4.37	7.1
21 . . . . .	5 22	70	5.32	82	4.72	22	4.35	6.5
22 . . . . .	5 37	88	5.26	75	4.72	22	4.35	6.5
23 . . . . .	5 51	105	5.31	81	4.66	18.1	4.44	9.2
24 . . . . .	5 27	76	5.26	75	4.72	22	4.46	9.8
25 . . . . .	5 42	94	5.22	70	5.37	88	4.45	9.5
26 . . . . .	5 43	96	5.22	70	5.02	48	4.27	4.9
27 . . . . .	5 32	82	5.32	82	4.92	38	4.24	4.3
28 . . . . .	5 16	63	5.52	106	4.86	32	4.24	4.3
29 . . . . .	5 16	63	5.72	130	4.77	25	4.26	4.7
30 . . . . .	5 12	59	6.00	164	4.76	24	4.39	7.7
31 . . . . .			6.02	166			4.30	5.4

① No readings taken on gauge until April 10.

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DAILY GAUGE-HEIGHT AND DISCHARGE Canyon Creek, near Mountain Mill, for 1911.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	4.32	5.8	4.31	5.6	4.86	32.	4.62	16.0
2.....	4.46	9.8	4.32	5.8	4.86	32.	4.59	14.6
3.....	4.45	9.5	4.41	8.3	4.87	33.	4.53	12.1
4.....	4.38	7.4	5.97	160	4.83	30.	4.53	12.1
5.....	4.38	7.4	6.32	202	4.83	30	4.52	11.8
6.....	4.37	7.1	6.02	166	4.78	26	4.50	11.0
7.....	4.92	38	6.12	178	4.77	25	4.52	11.8
8.....	5.06	52	6.17	184	4.76	24	4.87	33
9.....	4.94	40	6.07	172	4.75	23.8	4.64	17
10.....	4.86	32	5.72	130	4.74	23.0	4.84	31
11.....	4.74	23	5.70	128	4.70	20.5	4.84	31
12.....	4.65	17.5	5.52	106	4.69	19.9	4.84	31
13.....	4.56	13.3	5.42	94	4.69	19.9	4.84	31
14.....	4.52	11.8	5.32	82	4.68	19.3	4.84	31
15.....	4.48	10.4	5.26	75	4.67	18.7	4.84	31
16.....	4.47	10.1	5.22	70	4.66	18.1	.....	.....
17.....	4.44	9.2	5.12	59	4.65	17.5	.....	.....
18.....	4.42	8.6	5.07	53	4.64	17.0	.....	.....
19.....	4.41	8.3	5.04	50	4.63	16.5	.....	.....
20.....	4.37	7.1	5.02	48	4.62	16.0	.....	.....
21.....	4.40	8.0	4.97	43	4.61	15.5	.....	.....
22.....	4.40	8.0	5.02	48	4.61	15.5	.....	.....
23.....	4.39	7.7	4.99	45	4.60	15.0	.....	.....
24.....	4.35	6.5	5.06	52	4.62	16.0	.....	.....
25.....	4.32	5.8	5.04	50	4.62	16.0	.....	.....
26.....	4.35	7.7	5.02	48	4.64	17.0	.....	.....
27.....	4.42	8.6	4.97	43	4.65	17.5	.....	.....
28.....	4.37	7.1	4.92	38	4.66	18.1	.....	.....
29.....	4.33	6.0	4.92	38	4.55	12.9	.....	.....
30.....	4.32	5.8	4.89	35	4.55	12.9	.....	.....
31.....	4.25	4.5	.....	.....	4.57	13.7	.....	.....

## DAILY GAUGE-HEIGHT AND DISCHARGE of Canyon Creek, near Mountain Mill, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4 48	10	4 89	35	4 72	22	4 75	24
2.....	4 76	24	4 87	33	4 69	19 9	4 65	17 5
3.....	4 73	22	4 86	32	4 67	18 7	4 61	15 5
4.....	4 87	33	4 85	31	4 66	18 1	4 54	12 5
5.....	4 82	29	4 83	30	4 65	17 5	4 46	9 8
6.....	4 84	31	4 82	29	4 65	17 5	4 44	9 2
7.....	4 77	25	4 82	29	4 64	17 0	4 42	8 6
8.....	4 93	39	4 78	26	4 62	16 0	4 42	8 6
9.....	5 00	46	4 84	31	4 57	13 7	4 67	18 7
10.....	5 06	52	4 78	26	4 58	14 2	4 57	13 7
11.....	5 37	88	4 77	25	4 56	13 3	4 54	12 5
12.....	5 27	76	4 75	24	4 62	16 0	4 58	14 2
13.....	5 12	59	4 72	22	4 52	11 8	4 50	11 0
14.....	5 02	48	4 71	21	4 50	11 0	4 79	27 0
15.....	5 06	52	4 69	19 9	4 57	13 7	4 62	16 0
16.....	5 05	51	4 69	19 9	4 82	29	4 57	13 7
17.....	5 06	52	4 68	19 3	4 72	22	4 56	13 3
18.....	5 03	49	4 65	17 5	4 61	15 5	4 55	12 9
19.....	5 03	49	4 65	17 5	4 57	13 7	4 49	10 7
20.....	5 02	48	4 92	38	4 57	13 7	4 54	12 5
21.....	5 03	49	5 10	56	4 47	10 1	4 53	12 1
22.....	5 03	49	5 10	56	4 46	9 8	4 54	12 5
23.....	5 04	50	5 16	63	4 45	9 5	4 54	12 5
24.....	5 02	48	5 04	50	4 44	9 2	4 52	11 8
25.....	5 02	48	4 95	41	4 43	8 9	4 60	15 0
26.....	4 97	43	4 92	38	4 42	8 6	4 54	12 5
27.....	4 96	42	4 90	36	4 33	6 1	4 47	10 1
28.....	4 92	38	4 86	32	4 37	7 1	4 55	12 9
29.....	4 92	38	4 82	29	4 38	7 4	4 42	8 6
30.....	4 94	40	4 80	27	4 71	21 2	4 40	8 0
31.....	.....	.....	4 76	24	.....	.....	4 40	8 0

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DAILY GAUGE-HEIGHT AND DISCHARGE of Canyon Creek, near Mountain Mill, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4 40	8 0	4 17	3 3	4 19	3 6	4 32	5 8
2.....	4 42	8 6	4 17	3 3	4 18	3 4	4 29	5 2
3.....	4 38	7 4	4 17	3 3	4 17	3 3	4 27	4 9
4.....	4 45	9 5	4 17	3 3	4 24	4 3	4 32	5 8
5.....	4 40	8 0	4 15	3 4	4 23	4 2	4 26	4 7
6.....	4 38	7 4	4 17	3 3	4 22	4 0	4 24	4 3
7.....	4 36	6 8	4 17	3 3	4 21	3 9	4 32	5 8
8.....	4 35	6 5	4 17	3 3	4 20	3 7	4 46	9 8
9.....	4 34	6 3	4 18	3 4	4 22	4 0	4 26	4 7
10.....	4 33	6 1	4 17	3 3	4 24	4 3	4 36	6 8
11.....	4 34	6 3	4 16	3 1	4 25	4 5	4 26	4 7
12.....	4 32	5 8	4 16	3 1	4 24	4 3	4 26	4 7
13.....	4 30	5 4	4 17	3 3	4 23	4 2	4 27	4 9
14.....	4 29	5 2	4 18	3 4	4 24	4 3	4 32	5 8
15.....	4 28	5 0	4 18	3 4	4 23	4 2	4 56	13 3
16.....	4 29	5 2	4 18	3 4	4 22	4 0	.....	.....
17.....	4 27	4 9	4 15	3 0	4 25	4 5	.....	.....
18.....	4 26	4 7	4 14	2 9	4 23	4 2	.....	.....
19.....	4 25	4 5	4 17	3 3	4 25	4 5	.....	.....
20.....	4 24	4 3	4 17	3 3	4 27	4 9	.....	.....
21.....	4 24	4 3	4 18	3 4	4 26	4 7	.....	.....
22.....	4 23	4 2	4 19	3 6	4 26	4 7	.....	.....
23.....	4 22	4 0	4 21	3 9	4 25	4 5	.....	.....
24.....	4 21	3 9	4 20	3 7	4 24	4 3	.....	.....
25.....	4 20	3 7	4 23	4 2	4 23	4 2	.....	.....
26.....	4 19	3 6	4 23	4 2	4 23	4 2	.....	.....
27.....	4 22	4 0	4 22	4 0	4 24	4 3	.....	.....
28.....	4 18	3 4	4 21	3 9	4 24	4 3	.....	.....
29.....	4 18	3 4	4 21	3 9	4 37	7 1	.....	.....
30.....	4 17	3 3	4 21	3 9	4 48	10 4	.....	.....
31.....	4 17	3 3	.....	.....	4 38	7 4	.....	.....

MONTHLY DISCHARGE of Canyon Creek, near Mountain Mill, for 1911-12.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
April (10-30).....	105.	9 8	48 5	1 80	1 40	2,020
May.....	262	33	86 5	3 20	3 70	5,319
June.....	142.	18 1	52 1	1 93	2 15	3,100
July.....	23 8	4 3	9 97	0 37	0 43	613
August.....	52 0	4 5	13 0	0 48	0 55	799
September.....	202.	5 6	80 6	2 98	3 32	4,796
October.....	33.	12 9	20 4	0 76	0 88	1,254
November (1-15).....	33.	11 0	21 7	0 80	0 44	646
December.....	.....	.....	.....	.....	.....	.....
The period.....	.....	.....	.....	.....	12 87	18,547
1912						
April.....	88.	10 0	44 3	1 64	1 83	2,636
May.....	63	17 5	31 6	1 17	1 35	1,943
June.....	29	6 1	14 4	0 533	0 59	857
July.....	24	8 0	13 1	0 485	0 56	806
August.....	9 5	3 3	5 39	0 20	0 23	331
September.....	4 2	2 9	3 47	0 125	0 14	206
October.....	10 4	3 3	4 59	0 17	0 20	282
November (1-15).....	13 3	4 3	6 08	0 22	0 12	181
The period.....	.....	.....	.....	.....	5 02	7,242

## OLDMAN RIVER NEAR COWLEY.

This station was established by H. C. Ritchie, on September 15, 1908. It is located at a ford on the N.W.  $\frac{1}{4}$  Sec. 34, Tp. 7, Rge. 1, W. 5th Mer., and is approximately four miles north-east of Cowley.

The gauge, which is a plain staff graduated to feet and hundredths, is securely fastened to a post on the right bank and is connected with the channel by a ditch. The zero of the gauge (elevation 92.08) is referred to a permanent iron bench mark (assumed elevation 100.00), located on the right bank of the river, 90 feet east of the gauge.

Discharge measurements are made at the gauge, where a cable station has been erected for use during high water stages. During low water the river is waded at the same section. The points for soundings are permanently marked by a tagged wire, stretched directly above the cable.

The channel is straight for about 900 feet above and 250 feet below the section. The bed is of rock and gravel and is free from vegetation. The current has considerable velocity but flows smoothly till about 150 feet below the section where it breaks into small rapids. Both banks are high and wooded, neither being liable to overflow.

During 1911, the gauge was read by Mr. Hugh W. Pettit. In 1912, Mr. Pettit read the gauge until March 16; after that date Mr. J. H. Hughes made the observations.

## DISCHARGE MEASUREMENTS of Oldman River, near Cowley, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Fl. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
Jan. 21.	W. H. Greene.	158 0	116 70	0.99	2.84	116.82
Feb. 16.	do	140 0	74.95	1.14	3.33	858.04
Feb. 28.	do	140 0	79 35	1.22	3.29	96.54
Mar. 20.	do	159 0	159 82	1.46	3.98	234.02
April 6.	J. E. Degnan.	36 0	113 70	1.19	1.41	134.87
April 26.	do	194 0	335 05	3.51	2.64	1,177.24
May 18.	A. W. P. Lowrie.	200 0	459 00	4.99	3.40	2,290.77
June 6.	do	197 0	439 66	4.80	3.33	2,108.08
June 23.	do	188 0	360 91	4.50	2.93	1,623.58
July 13.	do	187 0	238 33	2.72	2.23	649.19
July 29.	do	180 0	176 05	1.67	1.93	294.33
Aug. 22.	do	188 0	232 95	2.34	2.23	545.18
Sept. 9.	do	199 0	381 50	4.15	3.03	1,575.57
Oct. 12.	N. McL. Sutherland.	180 0	191 85	2.21	2.02	423.19
Nov. 2.	do	140 0	133 65	1.61	1.66	215.03
Nov. 29.	do	143 0	130 54	1.26	2.30	164.74
Dec. 15.	do	183 0	125 25	1.25	2.21	156.12
1912.						
Jan. 4.	N. McL. Sutherland.	60 0	62 80	1.71	2.25	107.36
Jan. 22.	do	50 0	39 00	1.54	2.35	60.20
Feb. 5.	do	50 0	47 25	1.78	2.17	84.24
Feb. 18.	do	55 0	55 80	1.64	2.28	91.50
Mar. 5.	do	55 0	62 25	1.42	2.25	88.60
Mar. 16.	do	51 0	37 50	2.09	2.49	78.20
April 24.	do	180 0	194 20	2.47	1.96	478.40
May 25.	A. W. P. Lowrie.	197 0	338 27	3.41	2.85	1,155.15
June 14.	do	193 0	235 56	2.71	2.35	634.54
July 5.	do	192 0	298 60	2.98	2.62	890.43
July 29.	do	190 0	266 75	2.91	2.48	775.12
Aug. 16.	do	184 0	214 32	2.23	2.13	477.42
Sept. 7.	do	162 0	159 50	1.49	1.77	237.50
Sept. 27.	do	130 0	144 30	1.54	1.71	221.03
Oct. 17.	do	46 0	141.98	1.41	1.67	159.93
Nov. 8.	do	153 0	145 50	1.17	1.69	173.50
Dec. 5.	H. O. Brown.	178 0	138 00	1.04	1.50	142.00
Dec. 19.	do	150 0	111.75	1.31	1.92	146.22

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DAILY GAUGE-HEIGHT AND DISCHARGE of Oldman River, near Cowley, for 1911.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1 87	66	2 79	110	3 00	120	1 55	175	2 30	588	3 67	3,090
2	2 08	74	2 79	110	3 08	124	1 55	175	2 39	663	4 07	4,290
3	2 43	92	2 62	101	3 23	132	1 57	181	2 23	533	4 09	4,350
4	2 45	92	2 83	112	3 28	134	1 58	184	2 35	629	3 68	3,120
5	2 53	96	2 82	111	3 22	131	1 50	160	2 37	646	3 53	2,670
6	2 48	94	2 81	110	3 12	126	1 45	148	3 03	1,454	3 43	2,377
7	2 45	92	2 84	112	3 10	125	1 43	143	2 70	978	3 33	2,098
8	2 39	90	2 82	111	3 13	126	1 39	134	2 59	854	3 23	1,854
9	2 38	89	2 73	106	3 18	129	1 41	138	2 44	708	3 13	1,640
10	2 39	90	2 65	102	3 05	122	1 41	138	2 40	672	3 05	1,490
11	2 38	89	2 73	106	2 99	70	1 43	143	2 39	663	3 40	2,290
12	2 42	91	2 75	108	2 93	66	1 45	148	2 49	755	3 58	2,820
13	2 45	92	2 78	109	2 92	66	1 47	153	2 55	812	3 62	2,940
14	2 39	90	2 72	106	2 90	65	1 47	153	2 45	718	3 69	3,150
15	2 19	80	2 76	108	2 91	66	1 48	155	2 47	736	3 53	2,670
16	2 38	89	3 39	140	2 93	66	1 49	158	4 50	5,580	3 40	2,290
17	2 75	108	3 24	132	2 98	69	1 52	166	3 88	3,720	3 28	1,972
18	2 76	108	3 28	134	3 11	126	1 57	181	3 50	2,580	3 20	1,785
19	2 74	107	3 08	124	3 02	121	1 69	221	3 10	1,580	3 10	1,580
20	2 73	106	2 98	69	3 12	126	2 28	572	3 00	1,400	3 02	1,436
21	2 81	110	3 44	143	2 38	89	2 43	700	2 85	1,165	2 98	1,366
22	2 69	104	2 78	109	2 33	86	2 48	746	2 87	1,194	2 98	1,366
23	2 69	104	3 38	139	2 28	84	2 52	783	2 88	1,209	2 93	1,284
24	2 70	105	3 18	129	1 98	69	3 08	544	2 76	1,050	2 88	1,209
25	2 72	106	3 23	132	1 95	① 90	2 83	1,139	2 68	955	2 93	1,284
26	2 73	106	3 29	134	1 78	105	2 76	1,050	2 58	844	2 80	1,100
27	2 78	109	3 30	135	1 69	115	2 65	920	2 50	784	2 78	1,075
28	2 63	102	3 31	136	1 57	132	2 38	655	2 53	793	2 72	1,002
29	2 83	112	.....	.....	1 58	152	2 16	482	2 58	844	2 71	990
30	2 82	111	.....	.....	1 58	184	2 08	427	3 09	1,562	2 70	978
31	2 80	110	.....	.....	1 57	181	...	...	3 43	2,377	.....	.....

① Shifting conditions from March 25 to March 30.



DAILY GAUGE-HEIGHT AND DISCHARGE of Oldman River, near Cowley, for 1911.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1. ....	2.73	1,014	2.15	475	2.02	390	2.18	496	1.80	270	2.74	204
2. ....	2.68	955	2.15	475	2.02	390	2.17	489	1.68	217	2.71	201
3. ....	2.60	865	2.18	496	2.04	402	2.16	482	2.03	396	2.68	198
4. ....	2.58	844	2.28	572	3.63	2,970	2.12	454	2.07	421	2.66	196
5. ....	2.56	823	2.35	629	3.28	1,972	2.09	434	2.13	461	2.59	189
6. ....	2.49	755	2.45	718	3.23	1,854	2.08	427	1.87	⑤ 305	2.58	188
7. ....	2.45	718	2.75	1,038	3.18	1,743	2.07	421	2.18	390	2.53	183
8. ....	2.39	663	3.41	2,319	3.08	1,544	2.06	414	2.28	340	2.55	185
9. ....	2.37	646	3.14	1,660	3.06	1,508	2.05	408	2.38	300	2.55	185
10. ....	2.36	638	3.13	1,640	2.98	1,366	2.03	396	2.39	225	2.43	173
11. ....	2.31	596	3.12	1,620	2.98	1,366	2.02	390	2.44	⑤ 174	2.38	168
12. ....	2.28	572	3.11	1,600	2.88	1,209	2.01	384	2.78	208	2.53	183
13. ....	2.25	548	3.10	1,580	2.78	1,075	2.00	378	2.80	210	2.56	186
14. ....	2.23	533	2.89	1,223	2.77	1,063	1.99	372	3.03	233	2.58	188
15. ....	2.21	518	2.65	920	2.76	1,050	1.98	366	3.03	233	2.58	188
16. ....	2.19	503	2.54	802	2.73	1,014	1.96	354	3.04	334	2.61	191
17. ....	2.18	496	2.39	663	2.58	844	1.95	348	3.03	333	2.72	202
18. ....	2.15	475	2.35	629	2.53	793	1.93	337	3.98	328	2.52	182
19. ....	2.11	447	2.29	580	2.48	746	1.93	337	2.95	325	2.58	188
20. ....	2.10	440	2.23	533	2.47	736	1.93	337	2.93	223	2.62	192
21. ....	2.07	421	2.19	503	2.46	727	1.93	337	2.87	217	2.61	191
22. ....	2.04	402	2.18	496	2.38	655	1.93	337	2.76	206	2.75	205
23. ....	2.03	396	2.15	475	2.35	629	1.92	331	2.77	207	2.68	198
24. ....	2.02	390	2.13	461	2.30	588	1.91	326	2.76	206	2.72	202
25. ....	2.02	390	2.13	461	2.28	572	1.90	320	2.75	205	2.69	199
26. ....	2.06	414	2.12	454	2.27	564	1.88	310	2.73	203	2.68	⑥ 198
27. ....	2.07	421	2.10	440	2.25	548	1.87	305	2.74	204	2.67	180
28. ....	1.99	372	2.08	427	2.23	533	1.86	300	2.74	204	2.65	160
29. ....	1.93	337	2.05	408	2.21	518	1.87	305	2.75	205	2.58	135
30. ....	2.12	454	2.03	396	2.19	503	1.88	310	2.74	204	2.56	115
31. ....	2.13	461	2.02	390	.....	.....	1.86	300	.....	.....	2.57	98

① Shifting conditions from Nov. 6 to Nov. 11.

② Ice conditions curve from Nov. 11 to Dec. 25.

③ Shifting conditions from Dec. 25 to Dec. 31.

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Oldman River, near Cowley, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1. ....	2.20	80	2.33	86	2.35	88	2.70	978	1.99	372	2.62	887
2. ....	2.25	82	2.30	85	2.33	86	2.76	1,050	1.98	366	3.40	2,290
3. ....	2.29	84	2.31	86	2.35	87	2.79	1,088	1.97	360	3.40	2,290
4. ....	2.30	85	2.25	82	2.37	88	2.71	990	1.99	372	3.20	1,785
5. ....	2.29	84	2.17	78	2.40	90	2.67	943	2.03	396	2.90	1,238
6. ....	2.29	84	2.17	78	2.39	90	2.61	876	2.09	434	2.90	1,238
7. ....	2.27	83	2.15	78	2.37	88	3.30	2,020	2.10	440	2.50	764
8. ....	2.20	80	2.18	79	2.35	88	1.80	270	2.15	475	2.47	736
9. ....	2.17	78	2.18	79	2.35	88	1.90	320	2.20	510	2.45	718
10. ....	2.14	77	2.30	85	2.35	88	1.95	348	2.32	604	2.46	727
11. ....	2.16	78	2.45	92	2.31	86	2.18	496	2.44	708	2.44	709
12. ....	2.17	78	2.40	90	2.33	86	2.17	489	2.40	672	2.44	709
13. ....	2.26	83	2.38	89	2.32	86	2.14	468	2.90	1,238	2.40	672
14. ....	2.28	84	2.38	89	2.30	85	2.10	440	2.74	1,023	2.70	978
15. ....	2.30	85	2.36	88	2.31	86	1.98	366	2.80	1,100	2.90	1,238
16. ....	2.32	86	2.35	88	2.45	① 92	1.96	354	2.78	1,075	5.00	7,080
17. ....	2.30	85	2.35	88	.....	.....	1.99	372	2.77	1,063	5.02	7,140
18. ....	2.28	84	2.31	86	.....	.....	1.97	360	2.77	1,063	5.02	7,140
19. ....	2.30	85	2.29	84	.....	.....	1.93	337	2.75	1,038	4.98	7,020
20. ....	2.34	87	2.30	85	.....	.....	1.89	315	2.76	1,050	4.98	7,020
21. ....	2.32	86	2.31	86	.....	.....	1.89	315	2.76	1,050	4.82	6,540
22. ....	2.30	85	2.34	87	.....	.....	1.90	320	2.76	1,050	4.80	6,480
23. ....	2.41	90	2.35	86	.....	.....	1.90	320	2.74	1,026	4.40	5,280
24. ....	2.37	88	2.32	86	.....	.....	1.88	310	2.74	1,026	4.10	4,380
25. ....	2.37	88	2.37	88	.....	.....	1.90	320	2.74	1,026	3.92	3,840
26. ....	2.37	88	2.36	88	.....	.....	1.92	331	2.72	1,002	3.85	3,630
27. ....	2.35	88	2.35	88	.....	.....	1.93	337	2.73	1,014	3.82	3,540
28. ....	2.36	88	2.34	87	.....	.....	1.96	354	2.73	1,014	3.60	2,880
29. ....	2.36	88	2.34	87	.....	.....	1.96	354	2.73	1,014	3.10	1,580
30. ....	2.37	88	.....	.....	.....	.....	1.97	360	2.74	1,026	2.89	1,223
31. ....	2.35	87	.....	.....	.....	.....	.....	.....	2.73	1,014	.....	.....

① No observer available from March 17 to March 31.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Oldman River, near Cowley, for 1912.

DAY.	July.		August.		September.		October.		November.		December	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.78	1,075	2.44	709	1.79	265	1.73	238	1.62	196	1.84	① 145
2.....	2.74	1,026	2.44	709	1.80	270	1.74	243	1.64	203	1.91	145
3.....	2.65	920	2.47	736	1.79	265	1.76	252	1.64	203	1.96	145
4.....	3.40	2,290	2.60	865	1.79	265	1.77	256	1.65	206	2.00	145
5.....	2.65	920	2.90	1,238	1.78	261	1.75	247	1.65	206	2.05	145
6.....	2.66	932	2.50	764	1.77	256	1.71	229	1.66	210	2.13	145
7.....	2.66	932	2.50	764	1.77	256	1.71	229	1.67	214	2.70	146
8.....	2.67	943	2.46	727	1.78	261	1.72	234	1.69	221	3.20	170
9.....	2.70	978	2.44	709	1.79	265	1.75	247	1.68	217	3.20	170
10.....	2.74	1,026	2.36	638	1.78	261	1.72	234	1.68	217	2.90	150
11.....	2.84	1,152	2.34	621	1.76	252	1.71	229	1.69	221	2.80	148
12.....	2.82	1,126	2.34	621	1.75	247	1.71	229	1.68	217	2.48	145
13.....	2.85	1,165	2.30	588	1.74	243	1.70	225	1.69	221	2.48	145
14.....	2.88	1,209	2.24	540	1.77	256	1.70	225	1.70	225	2.47	145
15.....	2.90	1,238	2.25	548	1.79	265	1.68	217	1.70	225	2.46	145
16.....	2.88	1,209	2.14	468	1.78	261	1.67	214	1.69	221	2.46	145
17.....	2.85	1,165	2.12	454	1.76	252	1.67	214	1.71	229	2.43	145
18.....	2.84	1,152	2.13	461	1.75	247	1.66	210	1.70	225	2.44	145
19.....	2.86	1,180	2.14	468	1.77	256	1.66	210	1.70	225	2.45	145
20.....	2.88	1,209	2.17	489	1.78	261	1.65	206	1.69	221	2.46	145
21.....	2.89	1,223	2.10	440	1.77	256	1.66	210	1.70	225	2.44	145
22.....	2.75	1,038	2.08	427	1.76	252	1.67	214	1.69	① 221	2.44	145
23.....	2.68	955	2.06	414	1.76	252	1.68	217	1.69	205	2.45	145
24.....	2.71	990	1.98	366	1.78	261	1.67	214	1.68	190	2.43	145
25.....	2.70	978	1.98	366	1.75	247	1.69	221	1.69	178	2.44	145
26.....	2.71	990	1.97	360	1.73	238	1.67	214	1.67	155	2.45	145
27.....	2.69	966	1.99	372	1.71	229	1.66	210	1.70	150	2.44	145
28.....	2.90	1,238	1.98	366	1.71	229	1.66	210	1.78	155	2.44	145
29.....	2.48	746	1.98	366	1.71	229	1.64	203	1.89	170	2.43	145
30.....	2.50	764	1.95	348	1.73	238	1.65	206	1.88	145	2.44	145
31.....	2.46	727	1.93	337	.....	.....	1.64	203	.....	.....	2.44	145

① Shifting conditions from Nov. 22 to Nov. 30.

② Ice curve used from December 1 to December 31.

SESSIONAL PAPER No. 25d

MONTHLY DISCHARGE of Oldman River, near Cowley, for 1911-12.

(Drainage area 820 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
<b>1911</b>						
January.....	112	66	97.2	0.118	0.14	5,977
February.....	143	69	117.	0.143	0.15	6,498
March.....	184	66	110.	0.134	0.15	6,764
April.....	1,139	134	369.	0.45	0.50	21,957
May.....	5,580	533	1,262.	1.54	1.77	77,594
June.....	4,350	978	2,052.	2.50	2.79	122,100
July.....	1,014	337	565.	0.689	0.79	34,740
August.....	2,319	390	809.	0.987	1.14	49,743
September.....	2,970	390	996.	1.21	1.35	59,296
October.....	496	300	371.	0.452	0.52	22,812
November.....	461	174	266.	0.325	0.36	15,828
December.....	205	98	182.	0.222	0.26	11,191
The year.....					9.92	434,470
<b>1912</b>						
January.....	90	77	84.4	0.103	0.12	5,190
February.....	92	78	85.4	0.104	0.11	4,912
March (1-15).....	92	85	87.6	0.107	0.06	2,780
April.....	2,020	270	540.0	0.658	0.73	32,132
May.....	1,238	360	826.	1.01	1.16	50,789
June.....	7,140	672	3,058.	3.73	4.16	181,954
July.....	2,290	727	1,079.	1.32	1.52	66,348
August.....	1,238	337	557.	0.679	0.78	34,249
September.....	270	229	253.	0.308	0.34	15,055
October.....	256	203	223.	0.272	0.31	13,712
November.....	229	145	204.	0.249	0.28	12,139
December.....	170	145	147.	0.179	0.21	9,039
The year.....					9.78	428,299

TODD CREEK AT ELTON'S RANCH.

This station was established by H.C. Ritchie on August 3, 1909. It is located seven miles northwest of Cowley, at a private footbridge about twenty feet from Mr. Cecil Elton's house, on the S.W.  $\frac{1}{4}$  Sec. 19, Tp. 8, Rge. 1, W. 5th Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is driven into the bed of the stream and securely braced to the left bank. The zero of the gauge (elevation 93.02) is referred to a permanent iron bench mark (assumed elevation 100.00), twelve feet northeast of the gauge.

The channel is straight for about 55 feet above and 60 feet below the gauge. The right bank is high and wooded and liable to overflow in extreme high water. The left bank is wooded, and liable to overflow for about five feet from edge, where it rises abruptly to about six feet. The bed lies in one channel and is composed of clean sand and gravel. The current is inclined to be swift at high stages, but is quite sluggish at low.

Mr. Cecil Elton and Capt. Cardwell have irrigation ditches which divert water at points above this gauging station. Mr. Elton irrigates about 35 acres, and Capt. Cardwell about 90. Very little water was used during 1911 and 1912.

During 1911 and 1912, the gauge was read by Mr. Cecil Elton.

## DISCHARGE MEASUREMENTS of Todd Creek, near Cowley, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
April 8.	J. E. Degnan	8.5	4.42	1.06	2.82	4.70
April 24.	do	18.5	19.87	1.73	3.20	34.47
May 17.	A. W. P. Lowrie	19.7	48.88	3.16	4.30	156.37
June 8.	do	19.3	32.80	1.92	3.44	60.78
June 26.	do	20.0	22.78	1.23	3.10	28.09
July 14.	do	20.4	17.68	0.67	2.80	11.90
July 31.	do	19.7	17.79	0.77	2.86	13.65
Aug. 23.	do	19.7	17.49	0.67	2.80	11.76
Sept. 8.	do	20.0	23.46	1.38	3.12	32.36
Oct. 13.	N. McL. Sutherland	21.2	21.09	0.75	2.88	15.78
1912.						
April 25.	N. McL. Sutherland	21.3	22.76	1.02	2.97	23.20
May 24.	A. W. P. Lowrie	21.6	33.65	1.17	3.21	39.27
June 18.	do	21.8	31.64	1.05	3.18	33.18
July 9.	do	21.5	27.92	0.82	3.00	23.05
July 30.	do	21.4	24.35	0.58	2.86	14.21
Aug. 17.	do	21.3	24.05	0.53	2.82	12.67
Sept. 11.	do	21.0	22.60	0.37	2.71	8.34
Sept. 28.	do	21.6	24.35	0.42	2.77	10.05
Oct. 18.	do	21.8	25.08	0.43	2.78	10.89
Nov. 9.	do	21.8	28.40	0.39	2.81	11.02

## DAILY GAUGE-HEIGHT AND DISCHARGE of Todd Creek, near Cowley, for 1911.

DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			4.26		3.03	24	3.51	67	3.11	30
2			3.33		3.02	24	3.53	69	2.99	22.
3			3.27		3.00	22	3.49	65	2.96	20.1
4			3.27		3.01	23	3.47	63	2.94	18.9
5			3.13		3.05	26	3.49	65	2.93	18.3
6			2.97		3.05	26	3.49	65	2.91	17.1
7			2.81		3.03	24	3.46	62	2.87	15.0
8			3.29		3.01	23	3.45	61	2.86	14.5
9			3.35		3.01	23	3.41	57	2.85	14.0
10			3.17		3.01	23	3.35	51	2.85	14.5
11			3.07		3.01	23	3.33	49	2.83	13.0
12			3.03		2.98	21	3.29	46	2.83	13.0
13			3.05		3.07	27	3.28	45	2.82	12.5
14			2.92		3.43	59	3.27	43	2.79	11.1
15			2.84		3.54	70	3.25	42	2.80	11.5
16			2.87	15.0	3.87	107	3.21	38	2.81	12.0
17			2.93	18.3	4.19	145	3.18	36	2.80	11.5
18			2.96	20.1	3.80	99	3.17	35	2.83	13.0
19			3.09	29	3.55	72	3.13	32	2.80	11.5
20	①7.40		3.12	31.	3.49	65	3.09	29	2.81	12.0
21	6.68		3.17	35.	3.42	58	3.09	29	2.81	12.0
22	6.55		3.24	41.	3.37	53	3.09	29	2.81	12.0
23	6.66		3.29	46.	3.34	50	3.09	29	2.82	12.5
24	6.27		3.19	37.	3.39	55	3.09	29	2.81	12.0
25	6.25		3.25	42.	3.41	57	3.08	28	2.79	11.1
26	5.26		3.22	39.	3.43	59	3.07	27	2.77	10.3
27	5.76		3.14	32.	3.45	61	3.05	26	2.75	9.5
28	5.41		3.06	26.	3.61	78	3.01	23	2.75	9.5
29	5.15		3.04	25.	3.61	78	2.99	22	2.75	9.5
30	4.69		3.03	24.	3.59	76	3.07	27	2.85	14.0
31	4.43				3.50	66			2.85	14.0

① Ice conditions from March 20 to April 15. Not sufficient data to compute daily discharges during this period.

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Todd Creek, near Cowley, for 1911.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.83	13.0	2.74	9.1	2.95	19.5	2.80	11.5
2.....	2.81	12.0	2.74	9.1	2.95	19.5	2.81	12.0
3.....	2.85	14.0	2.77	10.3	2.93	18.3	2.91	17.1
4.....	2.89	16.0	3.08	28.0	2.93	18.3	2.91	17.1
5.....	2.91	17.1	3.21	46.0	2.93	18.3	2.91①	.....
6.....	2.99	22.0	3.26	43.	2.93	18.3	2.83	.....
7.....	3.23	40.	3.32	48.	2.92	17.7	2.79	.....
8.....	3.57	74.	3.12	31.	2.88	15.5	2.79	.....
9.....	3.28	45.	3.03	24.	2.87	15.0	.....	.....
10.....	3.19	37.	2.95	19.5	2.86	14.5	.....	.....
11.....	3.09	29.	2.92	17.7	2.87	15.0	.....	.....
12.....	2.98	21.	2.89	16.0	2.87	15.0	.....	.....
13.....	2.90	16.5	2.88	15.5	2.88	15.5	.....	.....
14.....	2.85	14.0	2.96	20.1	2.86	14.5	.....	.....
15.....	2.82	12.5	2.96	20.1	2.85	14.0	.....	.....
16.....	2.82	12.5	2.98	21.	2.85	14.0	.....	.....
17.....	2.84	13.5	2.99	22.	2.85	14.0	.....	.....
18.....	2.82	12.5	2.98	21.	2.85	14.0	.....	.....
19.....	2.81	12.0	2.94	18.9	2.83	13.0	.....	.....
20.....	2.80	11.5	2.95	19.5	2.83	13.0	.....	.....
21.....	2.84	13.5	2.98	21.	2.83	13.0	.....	.....
22.....	2.80	11.5	2.94	19.9	2.84	13.5	.....	.....
23.....	2.80	11.5	2.96	20.1	2.83	13.0	.....	.....
24.....	2.78	10.7.	3.00	22.5	2.80	11.5	.....	.....
25.....	2.79	11.1	2.97	21.0	2.76	9.9	.....	.....
26.....	2.81	12.0	2.98	21.	2.85	14.0	.....	.....
27.....	2.79	11.1	2.99	22.	2.79	11.1	.....	.....
28.....	2.80	11.5	2.98	21.	2.83	13.0	.....	.....
29.....	2.79	11.1	2.96	20.1	2.94	18.9	.....	.....
30.....	2.79	11.1	2.95	19.5	2.89	16.0	.....	.....
31.....	2.77	10.3	.....	.....	2.89	16.0	.....	.....

① Ice conditions after November 4.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Todd Creek, near Cowley, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.37	①	2.93	18.3	3.00	22.	3.00	22.
2.....	4.86	.....	2.92	17.7	2.98	21.	3.01	23.
3.....	4.80	.....	2.94	18.9	2.96	20.1	3.15	33.
4.....	4.57	.....	2.96	20.1	2.96	20.1	3.01	23.
5.....	4.18	.....	2.96	20.1	2.96	20.1	2.91	17.1
6.....	3.76	.....	2.94	20.1	2.96	20.1	2.88	15.5
7.....	3.62	.....	2.94	20.1	2.96	20.1	2.84	13.5
8.....	3.64	.....	2.93	18.3	2.90	16.5	2.93	18.3
9.....	3.54	.....	2.94	18.9	2.86	14.5	2.98	21.
10.....	3.34	.....	2.95	19.5	2.82	12.5	2.96	20.1
11.....	2.57	.....	2.95	19.5	2.81	12.0	2.91	17.1
12.....	3.70	.....	2.94	18.9	2.81	12.0	2.95	19.5
13.....	3.32	48.	2.92	17.7	2.80	11.5	2.94	18.9
14.....	3.12	31.	2.88	15.5	2.80	11.5	3.09	29.
15.....	3.14	32.	2.88	15.5	2.88	15.5	3.01	23.
16.....	3.06	26.	2.87	15.0	3.42	58.	2.94	18.9
17.....	3.05	25.	2.88	15.5	3.36	52.	2.94	18.9
18.....	3.04	25.	2.87	15.0	3.21	38.	2.94	18.9
19.....	3.12	31.	2.88	15.5	3.12	31.	2.90	16.5
20.....	3.07	27.	2.98	21.	3.04	25.	2.92	17.7
21.....	3.04	25.	3.22	39.	2.94	18.9	3.10	29.
22.....	3.02	24.	3.26	43.	2.94	18.9	3.08	28.
23.....	2.98	21.	3.26	43.	2.94	18.9	2.96	20.1
24.....	2.98	21.	3.21	38.	2.87	15.	2.96	20.1
25.....	2.96	20.1	3.13	32.	2.82	12.5	3.08	28.
26.....	2.96	20.1	3.08	28.	2.80	11.5	3.22	39.
27.....	2.96	20.1	3.07	27.	2.80	11.5	3.02	24.
28.....	2.96	20.1	3.03	24.	2.80	11.5	2.94	18.9
29.....	2.95	19.5	3.02	24.	2.80	11.5	2.90	16.5
30.....	2.95	19.5	3.03	24.	2.94	18.9	2.88	15.5
31.....	.....	.....	3.02	24.	.....	.....	2.90	16.5

①Ice conditions from April 1 to April 12. Not sufficient data to compute daily discharges during this period.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Todd Creek, near Cowley, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.82	12.5	2.76	9.9	2.72	8.3	2.72	8.3
2.....	2.83	13.0	2.76	9.9	2.72	8.3	2.78	10.7
3.....	2.96	20.1	2.74	9.1	2.70	7.5	2.76	9.9
4.....	3.10	29.	2.75	9.5	2.74	9.1	2.78	10.7
5.....	3.09	29.	2.74	9.1	2.74	9.1	2.74	9.1
6.....	2.99	22.	2.75	9.5	2.66	6.0	2.72	8.3
7.....	2.95	19.5	2.74	9.1	2.70	7.5	2.74	9.1
8.....	2.94	18.9	2.76	9.9	2.74	9.1	2.76	9.9
9.....	2.92	17.7	2.77	10.3	2.74	9.1	2.69	7.1
10.....	2.88	15.5	2.76	9.9	2.73	8.7	2.76	9.9
11.....	2.84	13.5	2.75	9.5	2.74	9.1	2.88	15.5
12.....	2.84	13.5	2.74	9.1	2.72	8.3	2.74	9.1
13.....	2.84	13.5	2.74	9.1	2.70	7.5	2.79	11.1
14.....	2.84	13.5	2.74	9.1	2.74	9.1	2.90	16.5
15.....	2.84	13.5	2.76	9.9	2.72	8.3	2.80	11.5
16.....	2.86	14.5	2.74	9.1	2.72	8.3	.....	.....
17.....	2.86	14.5	2.73	8.7	2.70	7.5	.....	.....
18.....	2.82	12.5	2.74	9.1	2.76	9.9	.....	.....
19.....	2.82	12.5	2.74	9.1	2.75	9.5	.....	.....
20.....	2.80	11.5	2.74	9.1	2.72	8.3	.....	.....
21.....	2.80	11.5	2.70	7.5	2.72	8.3	.....	.....
22.....	2.78	10.7	2.72	8.3	2.79	11.1	.....	.....
23.....	2.80	11.5	2.76	9.9	2.70	7.5	.....	.....
24.....	2.77	10.3	2.79	11.1	2.67	6.4	.....	.....
25.....	2.82	12.5	2.84	13.5	2.66	6.0	.....	.....
26.....	2.78	10.7	2.78	10.7	2.68	6.7	.....	.....
27.....	2.80	11.5	2.77	10.3	2.74	9.1	.....	.....
28.....	2.78	10.7	2.76	9.9	2.68	6.7	.....	.....
29.....	2.76	9.9	2.75	9.5	2.86	14.5	.....	.....
30.....	2.74	9.1	2.74	9.1	2.71	7.9	.....	.....
31.....	2.75	9.5	.....	.....	2.79	11.1	.....	.....

MONTHLY DISCHARGE of Todd Creek, near Cowley, for 1911-12.

(Drainage area 62 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
April (16-30).....	46.	15.0	30.7	0.50	0.28	914
May.....	145.	21.	52.2	0.84	0.97	3,210
June.....	69.	22.	43.	0.69	0.77	2,556
July.....	30.	9.5	13.9	0.22	0.25	855
August.....	74.	10.3	18.4	0.30	0.35	1,131
September.....	48.	9.1	22.3	0.36	0.40	1,327
October.....	19.5	9.9	15.1	0.24	0.28	928
November (1-4).....	17.1	11.5	13.9	0.22	0.03	110
The period.....					3.33	11,034
1912						
April (12-30).....	48.	19.5	25.3	0.408	0.27	904
May.....	43.	15.0	22.8	0.368	0.42	1,402
June.....	58.	11.5	20.1	0.324	0.36	1,196
July.....	39.	13.5	21.3	0.343	0.40	1,310
August.....	29.	9.1	14.4	0.232	0.27	884
September.....	13.5	7.5	9.59	0.155	0.17	571
October.....	14.5	6.0	8.51	0.137	0.16	523
November (1-15).....	16.5	7.1	10.4	0.168	0.09	309
The period.....					2.14	7,100



## COW CREEK NEAR COWLEY.

A gauging station located on Sec. 12, Tp. 8, Rge. 2, W. 5th Mer., on Abel Brux's farm, was established August 2, 1909, by H. C. Ritchie. In the spring of 1910 Mr. Brux moved away and as no other observer was available Mr. Ritchie established a new station at John Ross' ranch, on the N.E.  $\frac{1}{2}$  Sec. 14, Tp. 8, Rge. 2, W. 5th Mer., on May 26, 1910.

The gauge, which is a plain staff graduated to feet and hundredths, is located on the right bank. The zero (elevation 94.53) is referred to a permanent iron bench mark (assumed elevation 100.00), located on the right bank of the creek, 30 feet north of the gauge and 20 feet from the edge of the creek.

The channel is straight for 25 feet above and 40 feet below the station. Both banks are high, wooded and not liable to overflow. The bed is of clean sand and gravel.

Discharge measurements are made from a private bridge during high stages, the initial point for soundings being on the left bank. In low water the creek is waded.

During 1911 and 1912, the gauge was read by Mr. John Ross.

## DISCHARGE MEASUREMENTS of Cow Creek, near Cowley, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Fl. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
April 24.....	J. E. Degnan.....	9.8	11.74	1.30	2.30	15.31
April 8.....	do.....	6.5	4.00	0.84	2.34	3.38
May 17.....	A. W. P. Lowrie.....	10.0	18.70	2.52	3.05	47.11
June 8.....	do.....	9.0	13.43	1.79	2.50	24.11
June 26.....	do.....	9.0	9.42	1.04	2.05	9.77
July 14.....	do.....	9.0	6.75	0.55	1.80	3.73
July 31.....	do.....	9.2	7.32	0.58	1.85	4.24
Aug. 23.....	do.....	8.7	7.21	0.76	1.90	5.48
Sept. 8.....	do.....	9.0	10.19	1.32	2.23	13.49
Oct. 13.....	do.....	9.0	9.51	0.85	2.04	8.06
1912.						
April 25.....	N. McL. Sutherland.....	9.1	10.57	1.05	2.17	11.12
May 24.....	A. W. P. Lowrie.....	9.0	10.53	1.60	2.35	16.86
June 18.....	do.....	8.8	9.22	1.00	2.20	9.23
July 9.....	do.....	9.0	7.95	0.96	2.00	7.60
July 30.....	do.....	8.6	6.87	0.71	1.93	4.88
Aug. 17.....	do.....	8.8	6.85	0.65	1.91	4.45
Sept. 11.....	do.....	9.0	6.66	0.42	1.80	2.79
Sept. 28.....	do.....	9.4	7.45	0.32	1.85	2.46
Oct. 18.....	do.....	9.2	7.45	0.46	1.87	3.44
Nov. 9.....	do.....	9.0	8.78	0.46	1.98	4.03

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DAILY GAUGE-HEIGHT AND DISCHARGE of Cow Creek, near Cowley, for 1911.

DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			3.40		2.10	8.9	2.60	27.	2.00	6.4
2.....			3.25		2.10	8.9	2.60	27.	2.00	6.4
3.....			3.15		2.15	10.3	2.60	27.	1.95	5.3
4.....			3.05		2.15	10.3	2.65	29.	1.85	3.6
5.....			2.70		2.20	11.8	2.60	27.	1.85	3.6
6.....			2.55		2.30	15.0	2.55	25.	1.80	2.9
7.....			2.15		2.15	10.3	2.50	23.	1.80	2.9
8.....			2.05		2.15	10.3	2.50	23.	1.75	2.3
9.....			3.40		2.15	10.3	2.45	21.	1.75	2.3
10.....			3.35		2.15	10.3	2.40	18.7	1.70	1.9
11.....			3.30		2.15	10.3	2.35	16.8	1.70	1.9
12.....			2.50	23.	2.10	8.9	2.30	15.0	1.70	1.9
13.....			2.07	8.1	2.35	16.8	2.30	15.0	1.70	1.9
14.....			2.00	6.4	2.65	29.0	2.30	15.0	1.70	1.9
15.....			1.95	5.3	2.70	31	2.30	15.0	1.70	1.9
16.....			2.20	11.8	5.00	141	2.25	13.4	1.70	1.9
17.....			2.15	10.3	3.15	52	2.20	11.8	1.70	1.9
18.....			2.85	38.0	2.90	40	2.15	10.3	1.70	1.9
19.....			2.85	38.0	2.80	36	2.10	8.9	1.70	1.9
20.....			2.20	11.8	2.70	31	2.10	8.9	1.70	1.9
21.....	①5.55		2.60	27	2.65	29	2.10	8.9	1.70	1.9
22.....	5.15		2.70	31	2.65	29	2.05	7.6	1.70	1.9
23.....	4.85		2.50	23	2.60	27	2.05	7.6	1.70	1.9
24.....	4.80		2.30	15.0	2.70	31	2.05	7.6	1.70	1.9
25.....	4.75		2.50	23	2.75	33	2.05	7.6	1.70	1.9
26.....	4.75		2.45	21.	2.75	33	2.05	7.6	1.70	1.9
27.....	4.70		2.30	15.0	2.85	38	2.05	7.6	1.70	1.9
28.....	4.90		2.15	10.3	3.00	45	2.00	6.4	1.70	1.9
29.....	5.25		2.15	10.3	2.85	38	2.00	6.4	1.70	1.9
30.....	4.30		2.15	10.3	2.70	31	2.00	6.4	1.90	4.4
31.....	3.60				2.60	27			1.90	4.4

① Ice conditions from March 21 to April 11. Not sufficient data to compute the daily discharges during this period.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Todd Creek, near Cowley, for 1911.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.85	3.6	1.80	2.9	2.10	8.9	1.80	2.9
2.....	1.90	4.4	1.80	2.9	2.10	8.9	1.80	2.9
3.....	1.90	4.4	1.85	3.6	2.10	8.9	1.80	2.9
4.....	2.00	6.4	2.50	23.	2.10	8.9	1.80	2.9
5.....	1.90	4.4	2.50	23.	2.05	7.6	1.80	2.9
6.....	2.00	6.4	2.55	25.	2.05	7.6	1.80	2.9
7.....	2.65	29.0	2.40	18.7	2.05	7.6	1.80	2.9
8.....	2.30	15.0	2.30	15.0	2.05	7.6	1.75	2.3
9.....	2.50	23.	2.15	10.3	2.05	7.6	1.75	2.3
10.....	2.70	31.	2.15	10.3	2.05	7.6	1.75	2.3
11.....	2.15	10.3	2.10	8.9	2.05	7.6	1.75	2.3
12.....	2.10	8.9	2.10	8.9	2.05	7.6		
13.....	2.00	6.4	2.10	8.9	2.05	7.6		
14.....	2.00	6.4	2.10	8.9	2.05	7.6		
15.....	2.00	6.4	2.05	7.6	2.05	7.6		
16.....	2.00	6.4	2.05	7.6	2.05	7.6		
17.....	2.00	6.4	2.05	7.6	2.00	6.4		
18.....	1.90	4.4	2.05	7.6	2.00	6.4		
19.....	1.90	4.4	2.05	7.6	2.00	6.4		
20.....	1.85	3.6	2.05	7.6	2.00	6.4		
21.....	1.90	4.4	2.05	7.6	1.95	5.3		
22.....	1.90	4.4	2.05	7.6	1.95	5.3		
23.....	1.85	3.6	2.15	10.3	1.90	4.4		
24.....	1.85	3.6	2.15	10.3	1.90	4.4		
25.....	1.85	3.6	2.20	11.8	1.90	4.4		
26.....	1.85	3.6	2.20	11.8	1.90	4.4		
27.....	1.85	3.6	2.20	11.8	1.90	4.4		
28.....	1.85	3.6	2.20	11.8	1.85	3.6		
29.....	1.80	2.9	2.15	10.3	1.85	3.6		
30.....	1.80	2.9	2.10	8.9	1.85	3.6		
31.....	1.80	2.9			1.85	3.6		

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DAILY GAUGE-HEIGHT AND DISCHARGE of Cow Creek, near Cowley, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	①	.....	2.20	11.8	2.25	13.4	2.20	11.8
2.....			2.20	11.8	2.20	11.8	2.15	10.3
3.....			2.15	10.3	2.20	11.8	2.15	10.3
4.....			2.10	8.9	2.20	11.8	2.10	8.9
5.....			2.10	8.9	2.15	10.3	2.05	7.6
6.....			2.10	8.9	2.15	10.3	2.00	6.4
7.....	2.55	25.	2.10	8.9	2.15	10.3	2.00	6.4
8.....	2.50	23.	2.10	8.9	2.10	8.9	2.05	7.6
9.....	2.50	23.	2.10	8.9	2.10	8.9	2.05	7.6
10.....	2.50	23.	2.10	8.9	2.10	8.9	2.05	7.6
11.....	3.00	45.	2.10	8.9	2.05	7.6	2.05	7.6
12.....	2.80	36.	2.10	8.9	2.00	6.4	2.05	7.6
13.....	2.10	8.9	2.10	8.9	2.00	6.4	2.05	7.6
14.....	2.10	8.9	2.10	8.9	2.00	6.4	2.15	10.3
15.....	2.30	15.0	2.05	7.6	2.00	6.4	2.05	7.6
16.....	2.20	11.8	2.05	7.6	2.30	15.0	2.05	7.6
17.....	2.20	11.8	2.00	6.4	2.20	11.8	2.05	7.6
18.....	2.30	15.0	2.00	6.4	2.15	10.3	2.05	7.6
19.....	2.45	21.0	2.00	6.4	2.10	8.9	2.10	8.9
20.....	2.45	21.0	2.30	15.0	2.10	8.9	2.10	8.9
21.....	2.20	11.8	2.50	23.	2.00	6.4	2.10	8.9
22.....	2.25	13.4	2.50	23.	2.00	6.4	2.10	8.9
23.....	2.25	13.4	2.50	23.	2.00	6.4	2.10	8.9
24.....	2.25	13.4	2.40	18.7	2.00	6.4	2.10	8.9
25.....	2.25	13.4	2.30	15.0	2.00	6.4	2.15	10.3
26.....	2.25	13.4	2.30	15.0	2.00	6.4	2.20	11.8
27.....	2.20	11.8	2.30	15.0	2.00	6.4	2.20	11.8
28.....	2.20	11.8	2.25	13.4	2.00	6.4	2.00	6.4
29.....	2.20	11.8	2.25	13.4	2.00	6.4	1.95	5.3
30.....	2.20	11.8	2.25	13.4	2.25	13.4	1.90	4.4
31.....			2.25	13.4	.....	.....	1.90	4.4

① Ice conditions from April 1 to April 7.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Cow Creek, near Cowley, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.90	4.4	1.85	3.6	1.80	2.9	1.90	4.4
2.....	1.90	4.4	1.85	3.6	1.80	2.9	1.90	4.4
3.....	1.90	4.4	1.85	3.6	1.80	2.9	1.90	4.4
4.....	2.00	6.4	1.85	3.6	1.80	2.9	1.90	4.4
5.....	2.25	13.4	1.85	3.6	1.80	2.9	1.90	4.4
6.....	2.00	6.4	1.85	3.6	1.80	2.9	1.90	4.4
7.....	1.95	5.3	1.85	3.6	1.80	2.9	1.90	4.4
8.....	1.95	5.3	1.85	3.6	1.80	2.9	1.90	4.4
9.....	1.95	5.3	1.85	3.6	1.80	2.9	1.95	5.3
10.....	1.95	5.3	1.85	3.6	1.80	2.9	1.95	5.3
11.....	1.95	5.3	1.85	3.6	1.80	2.9	1.95	5.3
12.....	1.95	5.3	1.80	2.9	1.80	2.9	2.00	6.4
13.....	1.95	5.3	1.80	2.9	1.80	2.9	2.05	7.6
14.....	1.95	5.3	1.80	2.9	1.80	2.9	2.10	8.9
15.....	1.95	5.3	1.80	2.9	1.80	2.9	2.15	10.3
16.....	1.95	5.3	1.80	2.9	1.80	2.9		
17.....	1.95	5.3	1.80	2.9	1.85	3.6		
18.....	1.90	4.4	1.80	2.9	1.87	3.9		
19.....	1.90	4.4	1.80	2.9	1.87	3.9		
20.....	1.90	4.4	1.80	2.9	1.90	4.4		
21.....	1.90	4.4	1.80	2.9	1.90	4.4		
22.....	1.85	3.6	1.80	2.9	1.90	4.4		
23.....	1.85	3.6	1.85	3.6	1.90	4.4		
24.....	1.85	3.6	1.85	3.6	1.90	4.4		
25.....	1.85	3.6	1.85	3.6	1.90	4.4		
26.....	1.85	3.6	1.85	3.6	1.90	4.4		
27.....	1.85	3.6	1.85	3.6	1.90	4.4		
28.....	1.85	3.6	1.85	3.6	1.90	4.4		
29.....	1.85	3.6	1.85	3.6	1.90	4.4		
30.....	1.85	3.6	1.85	3.6	1.90	4.4		
31.....	1.85	3.6			1.90	4.4		

## MONTHLY DISCHARGE of Cow Creek, near Cowley, for 1911-12.

(Drainage area 28 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
April (12-30).....	38.	5.3	17.80	0.636	0.45	671
May.....	141.	8.9	27.80	0.993	1.14	1,709
June.....	29.	6.4	15.00	0.536	0.60	893
July.....	6.4	1.9	2.80	0.100	0.12	172
August.....	31.	2.9	7.43	0.265	0.30	457
September.....	25.	2.9	10.60	0.378	0.42	631
October.....	8.9	3.6	6.43	0.230	0.26	395
November (1-11).....	2.9	2.3	2.68	0.096	0.04	58
The period.....					3.33	4,986
1912						
April (7-30).....	45.	8.9	17.3	0.494	0.55	823.
May.....	23.	6.4	11.8	0.421	0.49	725.
June.....	15.0	6.4	8.85	0.316	0.35	527.
July.....	11.8	4.4	8.25	0.295	0.34	507.
August.....	13.4	3.6	4.88	0.174	0.20	300.
September.....	3.6	2.9	3.34	0.119	0.13	199.
October.....	4.4	2.9	3.57	0.128	0.15	220.
November (1-15).....	10.3	4.4	5.62	0.201	0.11	167.
The period.....					2.32	3,469.

CONNELLY CREEK NEAR LUNDBRECK.

This station was established on July 31, 1909, by H. C. Ritchie. It is located at a foot-bridge on the trail in the S.E.  $\frac{1}{4}$  Sec. 36, Tp. 7, Rge. 2, W. 5th Mer., and is about 100 feet from the mouth of the creek.

The gauge is a plain staff, graduated to feet and hundredths, nailed to a large tree on the left bank of the creek, about 8 feet above the footbridge. It is referred to a bench mark on a post on the left bank of the creek, 24 feet north of the gauge.

This stream has a very crooked channel, and it is very difficult to find a suitable place for gauging. For about 20 feet below and above the gauge the channel is practically straight. The right bank is low and liable to overflow at high stages of the stream. The left bank is fairly high. Both banks are thickly wooded near the water's edge. The bed is composed of sand and gravel, and is free from vegetation.

During high stages discharge measurements are made from the footbridge, the initial point for soundings being a stake on the left bank. During low stages measurements may be made at the same place by wading.

There is no observer for the gauge at this station.

DISCHARGE MEASUREMENTS of Connelly Creek, near Lundbreck, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 25.....	N. McL. Sutherland....	13.7	7.52	1.23	2.56	9.21
May 24.....	A. W. P. Lowrie.....	13.0	6.97	1.99	2.60	13.86
July 10.....	do.....	12.3	4.88	0.64	2.45	3.14
July 30.....	do.....	12.4	5.21	0.83	2.45	4.31
Aug. 17.....	do.....	12.2	4.86	0.60	2.40	2.90
Sept. 11.....	do.....	12.4	4.53	0.37	2.35	1.67
Oct. 18.....	do.....	12.7	5.54	0.70	2.45	3.90
Nov. 11.....	do.....	12.8	8.68	0.47	2.60	4.12

CROWSNEST RIVER AT LUNDBRECK.

This station was established September 7, 1907, by P. M. Sauder. It is located on the N.W.  $\frac{1}{4}$  Sec. 26, Tp. 7, Rge. 2, W. 5th Mer., at the traffic bridge just north of Lundbreck.

The gauge, which is a plain staff graduated to feet and hundredths, is placed at the left bank twenty feet downstream from the bridge. It is connected with the channel during low water stage by a ditch which is kept open by the hydrographer on his periodic trips. The zero of the gauge (elevation 91.76) is referred to a bench mark (assumed elevation 100.00), located on the north abutment of the traffic bridge.

The channel is straight for 250 feet above and 1,500 feet below the station. The right bank is high, wooded and will not overflow. The left bank is low, wooded and liable to overflow in extreme high water. The bed of the stream is of rock, giving a stable cross-section. The current is swift and tumultuous.

Discharge measurements are made from the bridge, the initial point for soundings being marked on the lower downstream chord, on a line with the face of the left abutment.

C. C. Moore read the gauge during 1911 and from January 1 to May 31, 1912, after May 31, E. Marlow made the observations.

## DISCHARGE MEASUREMENTS of Crowsnest River, at Lundbreck, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
Jan. 24. ....	W. H. Greene. ....	54.0	67.42	1.26	2.82	85.32
Feb. 21. ....	do. ....	52.0	129.50	0.81	3.31	105.07
Mar. 1. ....	do. ....	55.0	145.95	0.77	3.23	112.19
Mar. 22. ....	J. E. Degnan. ....	53.5	76.83	1.76	1.70	135.76
April 10. ....	do. ....	55.0	79.00	1.78	1.73	141.36
April 28. ....	do. ....	68.0	151.17	4.21	2.99	636.57
May 19. ....	A. W. P. Lowrie. ....	74.3	234.34	5.71	3.95	1,337.96
June 7. ....	do. ....	71.0	201.60	5.27	3.55	1,062.28
June 29. ....	do. ....	67.5	155.00	4.03	2.88	625.79
July 15. ....	do. ....	64.0	119.90	3.03	2.36	364.48
Aug. 1. ....	do. ....	61.0	102.08	2.17	2.15	220.13
Aug. 24. ....	do. ....	60.0	101.25	2.62	2.10	264.81
Sept. 14. ....	do. ....	67.0	152.25	4.15	2.85	623.33
Oct. 14. ....	N. McL. Sutherland. ....	58.5	97.30	2.48	2.17	241.38
1912.						
Jan. 5. ....	N. McL. Sutherland. ....	65.0	110.05	0.93	3.61	102.58
Jan. 24. ....	do. ....	65.0	72.80	1.26	3.01	92.00
Feb. 6. ....	do. ....	65.0	75.10	1.23	2.91	92.40
Feb. 19. ....	do. ....	65.0	74.80	1.09	2.69	81.44
Mar. 4. ....	do. ....	70.0	80.35	1.25	3.41	100.27
Mar. 20. ....	do. ....	65.0	56.50	1.16	2.96	65.50
Mar. 30. ....	do. ....	52.0	65.85	1.48	1.55	97.50
April 26. ....	do. ....	62.5	120.50	3.37	2.49	406.27
May 27. ....	A. W. P. Lowrie. ....	67.5	154.98	3.99	2.81	618.63
June 19. ....	do. ....	68.0	164.70	4.24	3.00	697.86
July 10. ....	do. ....	66.1	135.87	3.55	2.59	482.52
July 30. ....	do. ....	62.5	120.00	2.86	2.36	342.96
Aug. 19. ....	do. ....	60.0	95.20	2.16	2.02	205.90
Sept. 9. ....	do. ....	57.5	83.25	2.06	1.81	171.95
Sept. 28. ....	do. ....	56.5	81.18	1.80	1.73	146.16
Oct. 19. ....	do. ....	55.8	80.98	1.94	1.75	156.67
Nov. 11. ....	do. ....	51.0	79.30	1.68	1.72	133.50
Dec. 6. ....	H. O. Brown. ....	60.0	133.75	0.65	3.13	87.16

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Crownsnest River at Lundbreck, for 1911.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.30	76	2.90	88	3.25	95	1.78	148	2.85	615	4.03	1,391
2.....	2.30	76	2.90	88	3.45	99	1.75	142	2.95	675	4.35	1,615
3.....	2.30	76	2.90	88	3.40	98	1.75	142	3.00	705	4.41	1,657
4.....	2.60	82	2.91	88	3.25	95	1.65	124	3.15	795	4.15	1,475
5.....	2.60	82	2.85	87	3.40	98	1.63	120	3.40	955	4.00	1,370
6.....	2.58	82	2.95	89	3.25	95	1.60	115	3.55	1,055	3.71	1,167
7.....	2.68	84	2.90	88	3.30	96	1.70	132	3.20	825	3.60	1,090
8.....	2.65	83	2.90	88	3.27	95	1.68	129	3.16	801	3.54	1,048
9.....	2.50	80	2.93	89	3.23	95	1.70	132	3.05	735	3.45	988
10.....	2.60	82	2.93	89	3.17	93	1.73	138	3.00	705	3.45	988
11.....	2.60	82	3.25	95	3.05	91	1.65	124	2.94	669	3.47	1,000
12.....	2.75	85	3.35	97	3.00	90	1.71	134	2.95	675	3.55	1,053
13.....	2.85	87	3.25	95	3.00	90	1.71	134	3.20	825	3.65	1,125
14.....	2.93	89	3.25	95	3.00	90	1.73	138	3.06	741	3.65	1,125
15.....	2.94	89	2.90	88	2.95	89	1.72	136	3.55	1,055	3.55	1,055
16.....	2.90	88	2.90	88	3.05	91	1.81	155	5.55	2,455	3.46	994
17.....	2.91	88	2.90	88	3.05	91	2.00	205	4.86	1,972	3.40	955
18.....	2.90	88	2.89	88	3.05	91	2.03	216	3.35	922	3.33	910
19.....	2.90	88	2.85	87	2.90	88	2.13	250	4.00	1,370	3.25	858
20.....	2.90	88	2.89	88	1.78	148	2.35	344	3.75	1,195	3.10	765
21.....	2.91	88	2.92	88	1.78	148	2.65	498	3.56	1,062	3.05	735
22.....	2.90	88	3.00	90	1.70	132	3.00	705	3.41	962	3.09	759
23.....	2.90	88	3.45	99	1.75	142	2.81	591	3.45	988	3.05	735
24.....	2.87	87	3.40	98	1.78	148	3.05	735	3.35	922	3.05	735
25.....	2.90	88	3.36	97	1.75	142	3.25	858	3.24	851	3.15	795
26.....	2.90	88	3.35	97	1.68	129	3.60	1,090	3.15	795	3.15	795
27.....	2.87	87	3.25	95	1.69	130	3.30	890	3.15	795	3.05	735
28.....	2.88	88	3.00	90	1.68	129	3.05	735	3.30	890	2.96	699
29.....	2.90	88	.....	.....	1.71	134	2.90	645	3.37	936	2.90	645
30.....	2.90	88	.....	.....	1.75	142	2.90	645	3.60	1,090	2.85	615
31.....	2.89	88	.....	.....	1.81	155	.....	.....	3.80	1,230	.....	.....



## DAILY GAUGE-HEIGHT AND DISCHARGE of Crownsnest River at Lundbreck, for 1911.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.87	627	2.16	263	1.94	188	2.35	344	1.93	186	3.10	92
2.....	2.80	585	2.20	278	1.94	188	2.33	334	1.92	183	3.03	91
3.....	2.75	555	2.23	291	1.93	186	2.34	339	1.93	186	2.79	86
4.....	2.69	520	2.24	295	2.95	675	2.33	334	1.93	186	2.15	73
5.....	2.60	470	2.24	295	3.65	1,125	2.29	316	1.91	181	2.05	71
6.....	2.60	470	2.20	278	3.50	1,020	2.27	307	1.90	178	1.90	68
7.....	2.60	470	2.38	358	3.35	922	2.25	299	1.91	181	1.80	66
8.....	2.60	470	3.25	858	3.30	890	2.24	295	1.90	178	1.80	66
9.....	2.55	444	2.95	675	3.15	795	2.23	291	1.88	173	1.75	65
10....	2.50	418	2.87	627	3.05	735	2.20	278	1.89	175	1.93	69
11....	2.43	383	2.75	555	3.05	735	2.20	278	1.89	175	2.00	70
12....	2.43	383	2.60	470	3.94	1,328	2.17	267	1.90	178	2.10	72
13....	2.40	368	2.57	454	2.97	687	2.17	267	1.91	181	2.03	71
14....	2.40	368	2.45	393	2.93	663	2.15	259	3.05	⑤ 555	2.03	71
15....	2.36	349	2.37	354	2.79	579	2.15	259	3.14	430	2.00	70
16....	2.45	393	2.35	344	2.75	555	2.15	259	3.15	285	2.10	72
17....	2.40	368	2.30	320	2.65	498	2.14	255	3.05	250	2.15	73
18....	2.36	349	2.25	299	2.60	470	2.15	259	2.87	190	2.20	74
19....	2.40	368	2.22	286	2.55	444	2.13	251	2.80	170	⑤ 1.25	57
20....	2.37	354	2.19	274	2.50	418	2.13	251	2.63	125	1.85	67
21....	2.30	320	2.23	291	2.45	393	2.10	240	2.60	115	1.65	63
22....	2.27	307	2.17	267	2.45	393	2.05	222	2.55	100	2.05	71
23....	2.30	320	2.15	259	2.43	383	2.03	216	2.50	80	2.15	73
24....	2.30	320	2.11	244	2.41	373	2.05	222	2.55	81	3.10	92
25....	2.25	299	2.10	240	2.40	368	2.00	205	2.53	81	3.15	93
26....	2.25	299	2.17	267	2.37	354	1.95	192	2.30	76	3.25	95
27....	2.25	299	2.15	259	2.36	349	1.95	192	3.40	98	3.55	101
28....	2.19	274	2.13	251	2.37	354	1.94	189	3.10	92	3.65	103
29....	2.15	259	2.10	240	2.37	354	1.93	186	3.00	90	3.65	103
30....	2.24	295	2.05	222	2.36	349	1.92	183	3.20	94	3.65	103
31....	2.23	291	1.95	192	.....	.....	1.92	183	.....	.....	3.75	105

⑤ Shifting conditions from Nov. 14 to Nov. 22.

⑥ Ice jam up stream.

DAILY GAUGE-HEIGHT AND DISCHARGE of Crowsnest River at Lundbreck, for 1912.

DAY.	January..		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.81	106	2.76	85	3.42	98	1.57	110	2.41	373	2.51	423
2.....	3.76	105	2.56	81	3.13	93	1.63	120	2.38	358	2.46	398
3.....	3.81	106	2.86	87	3.26	95	1.73	128	2.33	334	2.44	388
4.....	3.56	101	2.81	86	3.06	91	1.81	155	2.32	330	2.40	368
5.....	3.61	102	2.86	87	3.01	90	1.90	178	2.35	344	2.38	358
6.....	3.56	101	2.96	89	3.20	94	1.73	138	2.37	354	2.38	358
7.....	3.76	105	2.93	89	3.09	92	1.76	144	2.48	408	2.34	339
8.....	3.66	103	3.18	94	2.88	88	1.90	178	2.65	498	2.36	349
9.....	3.46	99	2.96	89	3.01	90	2.19	274	2.84	609	2.42	378
10.....	3.46	99	2.96	89	3.30	96	2.37	354	2.76	561	2.36	349
11.....	3.41	98	3.01	90	3.11	92	2.71	531	2.71	531	2.41	373
12.....	3.46	99	3.01	90	3.03	91	2.66	503	2.67	508	2.40	368
13.....	3.51	100	2.87	87	3.12	92	2.46	398	2.71	531	2.40	368
14.....	3.56	101	2.86	87	2.79	86	2.31	325	2.77	567	2.42	378
15.....	3.56	101	2.81	86	3.11	92	2.30	320	2.83	603	2.41	373
16.....	3.56	101	2.82	86	3.15	91	2.37	354	2.93	663	3.34	916
17.....	3.46	99	2.80	86	3.01	90	2.36	349	2.96	681	3.28	877
18.....	3.51	100	2.76	85	3.04	91	2.41	373	2.80	639	3.14	789
19.....	3.46	99	2.70	84	3.74	105	2.40	368	2.82	597	3.04	729
20.....	3.16	93	2.31	76	2.56	81	2.36	349	2.81	591	3.90	1,300
21.....	3.26	95	2.78	86	2.92	88	2.44	388	2.80	639	2.76	561
22.....	3.16	93	2.92	88	3.07	91	2.47	403	2.88	633	2.66	503
23.....	3.11	92	2.46	79	3.14	93	2.48	408	2.93	663	2.68	514
24.....	3.06	91	2.81	86	3.33	97	2.51	423	2.83	603	2.57	454
25.....	3.06	91	2.88	88	3.25	95	2.53	434	2.78	573	2.51	423
26.....	3.01	90	2.61	82	3.12	92	2.50	418	2.76	561	2.50	418
27.....	3.01	90	3.07	91	1.83	① 160	2.44	388	2.81	591	2.44	388
28.....	3.01	90	2.80	86	1.68	129	2.44	388	2.78	573	2.44	388
29.....	3.04	91	2.41	78	1.62	118	2.46	398	2.71	531	2.41	373
30.....	3.04	91	.....	.....	1.52	103	2.47	403	2.73	543	2.58	460
31.....	3.06	91	.....	.....	1.51	102	.....	.....	2.56	449	.....	.....

① Ice went out during night.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Crowsnest River at Lundbreck, for 1912.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.68	514	2.31	325	1.85	165	1.70	132	1.78	148	2.00	205
2.....	2.74	549	2.32	330	1.86	168	1.68	129	1.68	129	2.00	175
3.....	2.78	573	2.30	320	1.85	165	1.70	132	1.68	129	2.02	150
4.....	2.64	492	2.41	373	1.83	160	1.71	134	1.61	117	2.05	130
5.....	2.56	449	2.33	334	1.81	155	1.70	132	1.64	122	2.05	100
6.....	2.51	423	2.31	325	1.80	152	1.71	134	1.64	122	2.06	71
7.....	2.50	418	2.24	295	1.80	152	1.69	130	1.64	122	2.06	71
8.....	2.56	449	2.22	286	1.82	157	1.71	134	1.68	129	2.05	71
9.....	2.58	460	2.18	270	1.81	155	1.70	132	1.72	136	2.00	70
10.....	2.59	465	2.14	255	1.82	157	1.68	129	1.74	140	1.90	68
11.....	2.74	549	2.14	255	1.81	155	1.68	129	1.72	136	1.90	68
12.....	2.71	531	2.12	248	1.82	157	1.66	125	1.73	138	4.12	112
13.....	2.66	503	2.10	240	1.83	160	1.66	125	1.71	134	3.73	105
14.....	2.96	681	2.10	240	1.82	157	1.64	122	1.78	148	3.58	102
15.....	2.81	591	2.06	226	1.84	162	1.64	122	1.82	157	3.65	103
16.....	2.82	597	2.08	233	1.79	150	1.64	122	1.81	155	3.76	105
17.....	2.76	561	2.05	222	1.78	148	1.68	129	1.80	152	3.65	103
18.....	2.71	531	2.04	219	1.75	142	1.71	134	1.78	148	3.70	104
19.....	2.61	476	2.02	212	1.78	148	1.70	132	1.79	150	3.68	104
20.....	2.74	549	2.00	205	1.76	144	1.74	140	1.81	155	3.60	102
21.....	2.71	531	1.97	197	1.75	142	1.72	136	1.79	150	3.48	100
22.....	2.61	476	1.96	194	1.77	146	1.71	134	1.76	144	3.60	102
23.....	2.56	449	1.94	189	1.81	155	1.70	132	1.76	144	3.95	109
24.....	2.62	481	1.91	181	1.76	144	1.71	134	1.75	142	3.75	105
25.....	2.61	476	1.94	189	1.77	146	1.70	132	1.76	144	3.70	104
26.....	2.57	454	1.92	183	1.76	144	1.71	134	1.71	134	3.72	104
27.....	2.51	423	1.90	178	1.76	144	1.71	134	1.92	183	3.68	104
28.....	2.44	388	1.91	181	1.75	142	1.72	136	1.95	192	3.60	102
29.....	2.41	373	1.89	173	1.72	136	1.70	132	1.80	152	3.54	101
30.....	2.36	349	1.86	168	1.71	134	1.71	134	2.00	205	3.60	102
31.....	2.32	330	1.84	162	.....	.....	1.84	162	.....	.....	3.55	101

SESSIONAL PAPER No. 25d

MONTHLY DISCHARGE of Crowsnest River at Lundbreck, for 1911-12.

(Drainage area 263 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
January.....	89	76	85.2	0.324	0.37	5,239
February.....	99	87	90.9	0.346	0.36	5,048
March.....	155	88	111.	0.422	0.49	6,825
April.....	1,090	115	352.	1.34	1.50	20,945
May.....	2,455	615	976.	3.71	4.28	60,012
June.....	1,657	615	996.	3.79	4.23	59,266
July.....	627	259	736.	2.80	3.23	45,255
August.....	858	192	345.	1.31	1.51	21,213
September.....	1,328	186	559.	2.12	2.36	33,263
October.....	344	183	257.	0.977	1.13	15,802
November.....	555	76	175.	0.677	0.76	10,413
December.....	105	57	78.9	0.30	0.35	4,851
The year.....					20.57	288,132
1912						
January.....	106	90	97.5	0.371	0.43	5,995
February.....	94	76	86.1	0.328	0.35	4,952
March.....	160	81	97.0	0.369	0.42	5,964
April.....	531	110	324.	1.23	1.37	19,279
May.....	681	330	530.	2.02	2.33	32,588
June.....	1,300	339	488.	1.86	2.08	29,038
July.....	681	330	487.	1.85	2.13	29,944
August.....	373	162	239.	0.909	1.05	14,696
September.....	168	134	151.	0.574	0.64	8,985
October.....	162	122	132.	0.502	0.58	8,116
November.....	205	117	145.	0.552	0.62	8,628
December.....	205	68	105.	0.399	0.46	6,458
The year.....					12.46	174,643

CROWSNEST RIVER NEAR FRANK.

This station was established on July 28, 1910, by H. C. Ritchie. It is located at the traffic bridge on Sec. 36, Tp. 7, Rge. 4, W. 5th Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a tree at the left bank about twenty feet downstream. It is referred to a bench mark, consisting of spikes driven into a tree stump, about three feet from the gauge; elevation 9.43 feet above datum of gauge.

The channel is straight for about 200 feet above the station and for 500 feet below, both banks being high, wooded and not liable to overflow. The bed of the stream is clean gravel.

The discharge measurements are made from the bridge during high water stages, the points for soundings being painted on the lower chord. In low stages the river is waded at the same section.

From January 1 to April 30, 1912, the gauge was read by Chas. Richardson, and during the remainder of the year by I. Wilson.

## DISCHARGE MEASUREMENTS of Crowsnest River, near Frank, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 6	N. McL. Sutherland	48.5	35.81	1.34	3.94	48.09
Jan. 25	do	54.5	38.60	1.32	3.98	51.10
Feb. 7	do	50.0	39.50	1.17	3.95	46.20
Feb. 20	do	47.5	27.90	1.20	3.75	33.40
Mar. 1	do	47.5	31.20	1.16	3.79	36.28
Mar. 19	do	47.0	31.30	1.15	3.81	35.90
April 1	do	48.5	38.29	1.24	3.94	47.51
April 27	do	65.5	87.68	2.86	4.71	250.94
May 28	A. W. P. Lowrie...	69.0	112.70	3.49	5.05	393.59
June 20	do	70.0	119.80	3.76	5.17	450.53
July 11	do	69.3	114.11	3.57	5.06	407.32
July 31	do	65.0	80.50	3.15	4.65	253.19
Aug. 20	do	63.2	49.75	2.50	4.42	124.56
Sept. 12	do	62.5	57.44	1.80	4.30	103.59
Oct. 1	do	54.0	45.92	1.57	4.16	72.14
Oct. 21	do	54.0	47.37	1.62	4.18	76.97
Nov. 14	do	63.0	62.40	1.88	4.30	117.20
Nov. 28	do	51.5	44.00	1.57	4.06	69.20
Dec. 9	H. O. Browne	51.5	42.27	1.27	4.05	53.23
Dec. 23	do	50.5	38.65	1.43	4.04	55.50

## DAILY GAUGE-HEIGHT AND DISCHARGE of Crowsnest River, near Frank, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	3.90	40	3.99	47	3.82	35	①3.95	44	4.65	216	4.89	316
2	3.89	39	3.98	46	3.82	35	①4.00	48	4.65	216	4.86	302
3	3.89	39	3.99	47	3.82	35	①4.10	60	4.65	216	4.85	298
4	3.92	42	3.99	47	3.82	35	4.26	91	4.66	220	4.82	284
5	3.97	46	3.98	46	3.83	36	4.18	74	4.68	227	4.78	268
6	3.96	45	3.99	47	①3.83	36	4.15	68	4.68	227	4.75	255
7	3.98	46	3.95	44	3.84	36	4.11	62	4.86	302	4.74	251
8	4.00	48	3.98	46	3.85	37	4.26	91	4.98	358	4.74	251
9	3.98	46	3.99	47	3.85	37	4.53	172	5.15	444	4.80	276
10	3.94	43	3.97	46	3.87	38	4.76	259	5.15	444	4.83	289
11	3.91	41	3.95	44	3.87	38	5.08	408	5.15	444	4.84	293
12	3.95	44	3.95	44	3.86	38	①4.90	320	5.14	439	4.84	293
13	3.92	42	3.93	42	3.86	38	4.64	212	5.15	444	4.85	298
14	3.97	46	3.92	42	3.85	37	4.55	179	5.15	444	4.84	293
15	3.98	46	3.93	42	3.85	37	4.55	179	5.25	496	5.33	538
16	4.00	48	3.97	46	3.85	37	4.58	190	5.30	522	5.64	710
17	3.98	46	3.96	45	3.85	37	4.39	193	5.31	527	5.53	649
18	3.99	47	3.94	43	3.82	35	4.65	216	5.25	496	5.44	595
19	4.00	48	3.75	33	3.79	34	4.66	220	5.24	491	5.34	543
20	4.00	48	①3.80	34	3.80	34	4.68	227	5.22	480	5.23	486
21	4.01	49	①3.85	37	3.82	35	4.74	251	5.20	470	5.15	444
22	3.99	47	3.87	38	3.84	36	4.75	255	5.19	465	5.10	418
23	3.98	46	3.85	37	3.85	37	4.76	259	5.16	449	5.02	378
24	4.00	48	3.83	36	3.86	38	①4.75	255	5.10	418	5.00	368
25	4.00	48	3.80	34	3.89	39	①4.75	255	5.05	393	4.98	358
26	4.01	49	3.79	34	3.89	39	①4.74	251	5.06	398	4.95	344
27	4.01	49	3.81	35	3.88	39	①4.74	251	5.09	413	4.94	339
28	4.01	49	3.81	35	①3.90	40	①4.72	243	5.08	408	4.94	339
29	4.01	49	3.80	34	3.93	42	①4.73	247	5.05	393	4.85	298
30	4.01	49			3.91	41	①4.73	247	5.00	368	5.05	393
31	4.01	49			3.94	43			4.91	325		

① Gauge height interpolated.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Crowsnest River, near Frank, for 1912.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.05	393	4.65	216	4.33	110	4.20	78	4.15	68	4.01	49
2.....	5.05	393	4.65	216	4.32	108	4.20	78	4.15	68	4.03	52
3.....	5.05	393	4.66	220	4.30	102	4.20	78	4.15	68	4.04	53
4.....	5.02	378	4.69	231	4.30	102	4.20	78	4.14	66	4.04	53
5.....	4.95	344	4.65	216	4.30	102	4.20	78	4.14	66	4.04	53
6.....	4.93	334	4.64	212	4.30	102	4.19	76	4.14	66	4.04	53
7.....	4.90	320	4.60	197	4.29	99	4.19	76	4.14	66	4.04	53
8.....	4.94	339	4.58	190	4.29	99	4.19	76	4.14	66	4.04	53
9.....	4.94	339	4.55	179	4.29	99	4.19	76	4.18	74	4.04	53
10.....	4.94	339	4.54	175	4.29	99	4.18	74	4.20	78	4.03	52
11.....	5.05	393	4.54	175	4.29	99	4.18	74	4.19	76	4.00	48
12.....	5.09	413	4.53	172	4.29	99	4.17	72	4.18	74	4.03	52
13.....	5.14	439	4.50	161	4.30	102	4.16	70	4.24	86	4.05	54
14.....	5.24	491	4.46	148	4.30	102	4.16	70	4.34	113	4.09	59
15.....	5.22	480	4.45	145	4.29	99	4.16	70	4.24	86	4.09	59
16.....	5.15	444	4.45	145	4.29	99	4.15	68	4.24	86	4.09	59
17.....	5.10	418	4.44	142	4.29	99	4.15	68	4.24	86	4.10	60
18.....	5.06	398	4.44	142	4.28	96	4.17	72	4.27	94	4.10	60
19.....	4.95	344	4.44	142	4.26	91	4.18	74	4.29	99	4.10	60
20.....	4.99	363	4.43	139	4.25	88	4.20	78	4.25	88	4.06	55
21.....	5.04	388	4.43	139	4.25	88	4.20	78	4.24	86	4.05	54
22.....	5.00	368	4.40	130	4.25	88	4.20	78	4.24	86	4.05	54
23.....	4.94	339	4.36	119	4.26	91	4.20	78	4.24	86	4.04	53
24.....	4.94	339	4.35	116	4.26	91	4.20	78	4.20	78	4.04	53
25.....	4.95	344	4.35	116	4.25	88	4.19	76	4.15	68	4.04	53
26.....	4.90	320	4.35	116	4.25	88	4.19	76	4.12	63	4.04	53
27.....	4.85	298	4.35	116	4.25	88	4.19	76	4.07	56	4.04	53
28.....	4.81	289	4.35	116	4.24	86	4.20	78	4.09	59	4.04	53
29.....	4.75	255	4.35	116	4.22	82	4.20	78	4.05	54	4.04	53
30.....	4.71	239	4.34	113	4.21	80	4.19	76	4.05	54	4.05	54
31.....	4.69	231	4.34	113	.....	.....	4.15	68	.....	.....	4.05	54

MONTHLY DISCHARGE of Crowsnest River, near Frank, for 1912.

(Drainage area 170 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	49	39	45.9	0.27	0.31	2,822
February.....	47	33	41.3	0.243	0.26	2,376
March.....	43	34	37.2	0.219	0.25	2,287
April.....	408	44	194.	1.14	1.27	11,544
May.....	527	216	392.	2.30	2.65	24,103
June.....	710	251	370.	2.10	2.43	22,016
July.....	491	231	360.	2.12	2.44	22,136
August.....	231	113	157.	0.924	1.06	9,654
September.....	110	80	95.5	0.562	0.63	5,683
October.....	78	68	74.9	0.441	0.51	4,605
November.....	113	54	75.5	0.444	0.50	4,493
December.....	60	48	54.1	0.318	0.37	3,326
The year.....	.....	.....	.....	.....	12.68	115,045

## CROWSNEST RIVER NEAR COLEMAN.

This station was established July 28, 1910, by H. C. Ritchie. It is located on the S.W.  $\frac{1}{4}$  Sec. 12, Tp. 8, Rge. 5, W. 5th Mer., at a private bridge about two and a half miles west of Coleman. The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a tree at the left bank about 150 feet upstream from the bridge. It is referred to a bench mark on top of a post thirty feet west of the gauge; elevation 10.16 above the zero of the gauge.

The channel is straight for thirty feet above and 300 feet below the station. Both banks are high, wooded, and will not overflow. The bed of the stream is of sand and gravel. The current is fairly swift.

Discharge measurements are made from the bridge during high stages, the initial point for soundings being on line with the face of the left abutment. In low stages the stream is waded three quarters of a mile downstream from the bridge.

During 1911 and 1912, the gauge was read by Prudent Le Gal, whose house is about 40 feet from the gauge.

## DISCHARGE MEASUREMENTS of Crowsnest River, near Coleman, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
April 11.....	J. E. Degnan.....	27.0	42.80	0.99	3.95	42.44
May 1.....	do.....	30.00	58.73	2.02	4.71	118.35
May 23.....	A. W. P. Lowrie.....	42.0	84.25	3.58	5.64	201.67
June 12.....	do.....	39.0	121.80	4.20	7.11	512.02
July 1.....	do.....	37.0	87.16	4.03	5.92	352.11
July 18.....	do.....	36.0	79.00	2.74	5.42	216.29
Aug. 3.....	do.....	35.0	68.85	2.25	5.10	154.80
Aug. 26.....	do.....	44.0	42.11	2.03	4.72	85.38
Sept. 18.....	do.....	44.0	44.46	2.26	4.89	100.28
Oct. 17.....	N. McL. Sutherland.....	43.0	37.70	2.45	4.50	92.22
Nov. 15.....	do.....	33.0	78.70	0.60	4.80	47.24
Dec. 4.....	do.....	31.5	24.23	1.79	4.08	43.40
Dec. 18.....	do.....	28.0	22.48	1.42	4.46	31.90
1912.						
Jan. 8.....	N. McL. Sutherland.....	29.5	34.50	0.94	4.25	32.56
Jan. 25.....	do.....	26.3	21.70	1.49	3.85	32.30
Feb. 8.....	do.....	28.0	21.50	1.32	3.81	28.24
Feb. 20.....	do.....	30.0	24.33	1.65	3.82	40.10
Mar. 1.....	do.....	27.5	22.64	1.33	3.84	30.06
Mar. 19.....	do.....	27.0	21.44	1.34	3.63	28.70
April 1.....	do.....	29.8	23.69	1.33	3.67	31.42
April 30.....	do.....	33.5	33.27	2.50	4.26	83.13
May 30.....	A. W. P. Lowrie.....	45.7	51.83	2.96	5.16	153.50
June 22.....	do.....	31.0	63.25	3.76	5.60	238.10
July 12.....	do.....	31.4	65.82	3.11	5.62	204.86
Aug. 1.....	do.....	34.0	29.76	3.61	4.94	107.53
Aug. 22.....	do.....	43.8	37.92	2.24	4.56	84.94
Sept. 13.....	do.....	42.8	38.67	1.84	4.48	71.16
Oct. 2.....	do.....	41.1	29.85	2.05	4.21	61.06
Oct. 23.....	do.....	41.5	32.03	1.61	4.20	51.60
Nov. 15.....	do.....	27.5	52.50	1.52	4.21	79.60
Nov. 28.....	do.....	31.0	61.20	0.68	4.28	41.48
Dec. 9.....	H. O. Brown.....	25.5	46.70	0.92	4.04	43.29
Dec. 23.....	do.....	22.5	44.46	1.05	4.02	46.77

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE OF Crowsnest River, near Coleman, for 1911.

DAY.	March.		April.		May.		June. <sup>1</sup>		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			4.04	49	4.83	135	6.53	501	5.90	①350
2.....			3.93	40	4.84	136	6.81	568	5.90	348
3.....			3.91	39	4.91	148	6.94	670	5.81	326
4.....			3.92	40	4.93	151	6.83	573	5.72	303
5.....			3.96	43	4.96	156	6.62	499	5.69	296
6.....			3.91	39	5.01	164	6.21	424	5.70	298
7.....			3.91	39	5.24	206	6.24	432	5.68	290
8.....			3.92	40	5.25	208	6.21	424	5.69	292
9.....			4.01	47	5.41	239	6.24	432	5.52	253
10.....			4.01	47	5.21	200	6.21	424	5.48	241
11.....			3.95	42	5.04	169	6.43	477	5.49	242
12.....			3.91	39	5.02	166	7.11	640	5.48	238
13.....			3.94	41	5.04	169	6.68	537	5.43	226
14.....			3.93	40	5.04	169	6.71	544	5.50	240
15.....			3.95	42	5.41	239	6.81	568	5.48	233
16.....			3.96	43	6.23	429	6.70	542	5.49	233
17.....			3.97	44	6.22	427	6.48	489	5.51	236
18.....			4.01	47	6.11	400	6.39	468	5.40	210
19.....		21	4.03	48	5.91	352	6.38	465	5.38	206
20.....	3.73	28	4.06	51	5.81	328	6.31	448	5.28	187
21.....	3.81	33	4.26	67	5.83	333	6.28	441	5.30	191
22.....	3.85	35	4.24	66	5.81	328	6.30	446	5.28	187
23.....	4.01	47	4.34	75	5.74	312	6.28	441	5.30	191
24.....	4.06	51	4.44	85	5.54	268	6.28	441	5.29	189
25.....	4.16	59	4.61	105	5.31	219	6.39	468	5.29	189
26.....	3.91	39	4.67	112	5.54	268	6.30	446	5.28	187
27.....	3.91	39	4.73	120	5.56	272	6.11	400	5.20	172
28.....	4.03	48	4.74	122	5.53	265	6.01	376	5.18	169
29.....	4.11	55	4.76	124	5.53	265	5.93	357	5.11	157
30.....	3.96	43	4.81	132	5.62	285	5.93	357	5.08	152
31.....	3.92	40			6.32	451			5.11	157

① Shifting conditions from July 1 to July 18.



## DAILY GAUGE-HEIGHT AND DISCHARGE of Crowsnest River, near Coleman, for 1911.

DAY.	August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.08	152	4.70	93	4.78	③ 104	3.40	12	4.32	34
2.....	5.20	172	4.70	93	4.78	108	3.40	12	4.31	34
3.....	5.13	160	4.80	107	4.71	100	3.40	12	4.31	34
4.....	5.08	152	5.71	276	4.70	100	3.40	12	4.31	34
5.....	5.10	155	5.64	261	4.71	103	3.39	12	4.30	34
6.....	5.18	169	5.61	254	4.70	105	3.38	11	4.28	34
7.....	5.20	172	5.49	228	4.70	108	3.58	19	4.28	34
8.....	5.53	237	5.29	189	4.63	100	3.68	25	4.28	34
9.....	5.48	226	5.18	169	4.63	102	5.48	255	4.28	34
10.....	5.29	189	5.24	180	4.61	101	5.63	③ 288	4.28	34
11.....	5.31	193	5.30	191	4.99	100	5.58	240	4.28	34
12.....	5.30	191	5.38	206	4.88	101	5.28	152	4.29	34
13.....	5.08	152	5.39	208	5.18	206	5.78	211	4.14	32
14.....	5.11	167	5.28	187	4.68	105	5.98	214	4.14	32
15.....	5.10	155	5.20	172	4.78	138	6.08	194	4.14	32
16.....	5.01	140	5.13	160	4.48	94	5.88	124	4.14	32
17.....	4.99	136	5.01	140	4.18	60	5.81	111	4.14	32
18.....	4.93	127	4.99	136	4.28	69	5.81	111	4.63	41
19.....	4.90	122	4.91	124	4.18	60	5.78	106	4.88	46
20.....	4.91	124	4.90	122	3.53	17	5.73	100	4.58	40
21.....	4.90	122	4.90	122	3.60	16	5.68	94	4.21	33
22.....	4.88	119	4.88	119	3.50	16	4.18	32	4.24	33
23.....	4.82	110	4.89	120	3.50	16	4.18	32	4.23	33
24.....	4.80	107	4.89	120	3.50	16	4.68	42	4.13	31
25.....	4.79	106	4.83	112	3.50	16	4.18	32	4.18	32
26.....	4.73	97	4.83	112	3.50	16	4.58	40	4.22	33
27.....	4.78	104	4.80	107	3.48	15	4.58	40	4.24	33
28.....	4.71	94	4.79	106	3.48	15	4.81	44	4.27	34
29.....	4.71	94	4.79	106	3.48	15	4.88	46	4.23	33
30.....	4.71	94	4.79	106	3.43	13	4.42	36	4.28	34
31.....	4.70	93			3.41	12			4.28	34

③ Shifting conditions from October 1 to October 17.

④ Shifting conditions from November 10 to November 16.

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Crowsnest River, near Coleman, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	4.35	39	3.93	31	4.06	33	3.68	33	3.26	30	5.10	147
2.....	4.35	39	3.88	31	3.98	32	3.68	33	3.23	30	4.98	131
3.....	4.47	41	4.13	35	4.00	32	3.73	34	3.23	30	4.96	129
4.....	4.68	46	4.28	38	3.98	32	3.73	34	3.28	30	4.94	126
5.....	4.32	38	3.87	31	3.96	32	3.73	34	3.28	30	4.98	131
6.....	4.16	35	3.83	30	3.94	31	3.73	34	3.29	30	5.00	134
7.....	3.92	31	3.83	30	3.92	31	3.73	34	3.33	30	5.03	138
8.....	4.13	35	3.88	31	3.80	30	3.73	34	4.41	74	5.18	138
9.....	4.14	35	4.08	34	3.88	31	3.75	34	4.63	94	5.23	165
10.....	4.15	35	4.13	35	3.90	31	3.78	35	4.78	108	5.26	169
11.....	4.16	35	3.90	31	4.04	33	4.03	47	4.88	119	5.28	172
12.....	5.32	64	3.83	30	3.72	29	4.03	47	4.99	133	5.38	186
13.....	5.05	56	3.80	30	3.66	29	4.03	47	5.07	143	5.38	186
14.....	4.64	45	3.78	30	3.70	29	4.03	47	4.13	53	5.28	172
15.....	4.53	43	3.87	31	4.04	33	4.04	47	5.18	158	5.38	186
16.....	4.43	41	3.83	30	3.86	31	4.04	47	5.56	214	5.79	252
17.....	4.40	40	3.86	31	3.84	30	4.05	48	5.58	217	5.96	283
18.....	4.26	37	3.78	30	3.83	30	4.07	49	5.58	217	5.89	270
19.....	4.14	35	3.80	30	3.63	28	4.08	50	5.64	226	5.80	254
20.....	4.22	36	4.29	38	3.61	28	4.08	50	5.38	186	5.73	241
21.....	3.90	31	3.88	31	3.70	29	4.10	51	5.26	169	5.62	223
22.....	3.93	31	3.86	31	3.66	29	4.13	53	5.22	164	5.56	214
23.....	4.03	33	3.88	31	3.63	28	4.13	53	5.18	158	5.53	209
24.....	3.80	30	3.85	30	3.38	27	4.22	59	5.17	157	5.49	203
25.....	3.92	31	3.86	31	2.98	26	4.24	61	5.16	155	5.45	196
26.....	3.91	31	3.84	30	2.98	26	4.27	63	5.26	169	5.40	189
27.....	3.84	30	3.86	31	2.98	26	4.27	63	5.39	188	5.41	190
28.....	3.80	30	3.88	31	3.38	30	4.28	64	5.26	169	5.26	169
29.....	3.78	30	4.00	32	3.38	30	4.33	67	5.23	165	5.36	183
30.....	3.95	32	.....	.....	3.38	30	4.30	65	5.22	164	5.38	186
31.....	4.02	32	.....	.....	3.38	30	.....	.....	5.13	151	.....	.....

① River clear of ice.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Crowsnest River, near Coleman, for 1912.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.40	189	4.94	126	4.35	69	4.19	57	4.22	59	4.14	54
2.....	5.51	206	4.94	126	4.34	68	4.19	57	4.19	57	4.12	52
3.....	5.57	215	4.92	124	4.50	82	4.19	57	4.21	59	4.10	51
4.....	5.36	183	4.88	119	4.39	72	4.19	57	4.22	59	4.07	49
5.....	5.51	206	4.85	116	4.34	68	4.19	57	4.17	56	4.35	69
6.....	5.46	198	4.81	111	4.34	68	4.22	59	4.14	54	4.32	67
7.....	5.41	190	4.76	106	4.34	68	4.26	62	4.11	52	4.18	57
8.....	5.36	183	4.74	104	4.34	68	4.20	58	4.13	53	4.18	57
9.....	5.56	214	4.74	104	4.34	68	4.20	58	4.13	53	4.14	54
10.....	5.67	231	4.74	104	4.36	70	4.22	59	4.12	52	4.12	52
11.....	5.69	234	4.74	104	4.39	72	4.22	59	4.13	53	4.17	56
12.....	5.71	238	4.74	104	4.39	72	4.17	56	4.14	54	4.13	⑤35
13.....	5.75	245	4.74	104	4.39	72	4.15	54	4.11	54	4.08	34
14.....	5.71	238	4.74	104	4.45	78	4.15	54	4.13	53	4.00	32
15.....	5.68	233	4.74	104	4.42	75	4.14	54	4.21	59	3.98	32
16.....	5.59	218	4.66	96	4.39	72	4.16	55	4.58	89	3.97	32
17.....	5.54	210	4.64	95	4.36	72	4.20	58	4.31	66	3.94	31
18.....	5.41	190	4.66	96	4.34	68	4.19	57	4.28	64	3.93	31
19.....	5.38	186	4.65	96	5.14	153	4.19	57	4.26	62	3.97	32
20.....	5.57	215	4.65	96	4.75	105	4.19	57	4.30	65	3.98	32
21.....	5.36	183	4.65	96	4.26	62	4.20	58	4.27	63	3.99	32
22.....	5.36	183	4.61	92	4.25	62	4.19	57	4.22	59	4.08	34
23.....	5.16	155	4.55	87	4.19	57	4.19	57	4.20	58	4.02	32
24.....	5.11	148	4.52	84	4.19	57	4.18	57	4.19	57	4.01	32
25.....	5.15	154	4.49	81	4.19	57	4.18	57	4.24	61	4.01	32
26.....	5.13	151	4.49	81	4.19	57	4.18	57	4.56	87	4.06	32
27.....	5.11	148	4.48	80	4.19	57	4.18	57	4.81	111	4.00	32
28.....	5.05	140	4.47	79	4.19	57	4.20	58	4.51	83	4.00	32
29.....	5.01	135	4.45	78	4.19	57	4.22	59	4.25	62	4.02	32
30.....	4.97	130	4.39	72	4.19	57	4.22	59	4.22	59	4.04	33
31.....	4.97	130	4.37	71	.....	.....	4.22	59	.....	.....	4.02	32

⑤ River frozen over.

MONTHLY DISCHARGE of Crowsnest River, near Coleman, in 1911-12.

(Drainage area 68 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
<b>1911</b>						
March (19-31).....	59	21	41.4	0.61	0.29	1,067
April.....	132	39	62.3	0.92	1.03	3,707
May.....	451	135	253.0	3.72	4.29	15,556
June.....	670	357	477.0	7.01	7.82	28,383
July.....	350	152	232.0	3.41	3.93	14,265
August.....	237	93	143.0	2.10	2.42	8,793
September.....	276	93	154.0	2.26	2.32	9,164
October.....	206	12	69.3	1.02	1.18	4,261
November.....	288	11	88.5	1.30	1.45	5,266
December.....	46	31	34.1	0.50	0.58	2,097
The period.....					25.51	92,559
<b>1912</b>						
January.....	64	30	37.0	0.544	0.63	2,275
February.....	38	30	31.6	0.465	0.50	1,518
March.....	33	26	29.9	0.440	0.51	1,838
April.....	67	33	47.3	0.696	0.78	2,814
May.....	226	30	128.0	1.880	2.17	7,570
June.....	283	126	186.0	2.740	3.06	11,068
July.....	245	130	190.0	2.790	3.22	11,682
August.....	126	71	98.1	1.440	1.66	6,032
September.....	153	57	70.6	1.040	1.16	4,201
October.....	62	54	57.3	0.843	0.97	3,523
November.....	111	52	62.5	0.920	1.03	3,719
December.....	69	31	40.8	0.600	0.69	2,500
The year.....					16.38	59,349

SUMMIT CREEK NEAR CROW'S NEST.

This station was established by N. McL. Sutherland on April 29, 1912. It is located on the S.W.  $\frac{1}{4}$  Sec. 12, Tp. 8, Rge. 6, W. 5th Mer., and is about a quarter of a mile south of the railway station at Crow's Nest, 1000 feet south of the Canadian Pacific Railway concrete dam and 450 feet south of Mr. A. Good's dam.

The gauge, which is a rod graduated to feet and hundredths, is nailed to a tree on the right bank of the creek. It is referred to a bench mark on a stump, 18 feet downstream from the gauge; elevation 3.99 feet above the datum of the gauge.

The channel is straight for 15 feet above and 50 feet below the gauge. The right bank is high, heavily timbered and not liable to overflow. The left bank is low, wooded, and liable to overflow. The bed of the stream is of gravel and clear of vegetation. The current is swift.

Discharge measurements are made by wading at the gauge, the initial point for soundings being a post on the left bank. At low stages measurements are made with a weir at a point 15 feet below the gauge.

There is no observer for the gauge at this station.

DISCHARGE MEASUREMENTS of Summit Creek, near Crow's Nest, in 1912.

Date.	Hydrographer.	Width.	Area of [Section.]	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Ft per sec.	Feet.	Sec.-ft.
Feb. 21.....	N. McL. Sutherland.....	2.3	0.40	0.60	1.46	0.24
Mar. 31.....	do.....	2.6	0.49	0.44	1.42	0.22
April 29.....	do.....	6.6	3.18	1.46	1.80	4.65
May 29.....	A. W. P. Lowrie.....	8.7	4.35	0.57	1.75	2.46
June 21.....	do.....	5.8	1.89	1.11	1.68	2.10
July 12.....	do.....	10.0	3.32	1.23	1.80	4.07
Aug. 1.....	do.....				1.62	1.02②
Aug. 21.....	do.....				1.55	0.71②
Sept. 13.....	do.....				1.52	0.48②
Oct. 2.....	do.....				1.53	0.41②
Oct. 22.....	do.....	7.20	1.53	0.35	1.56	0.54
Nov. 14.....	do.....	7.00	2.22	0.25	1.56	0.54

② Weir measurement.

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Oldman River drainage basin, in 1912.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge
				Feet.	Sq. feet.	Feet per Sec.	Sec.-ft.
May 1	N. McL. Sutherland	Blairmore Creek...	Sec. 10-8-4-5...	23.2	15.33	2.10	32 13
" 28	A. W. P. Lowrie	do	do	20.5	14.37	1.87	26.92
June 20	do	do	do	19.8	13.36	2.06	27.47
July 11	do	do	do	20.1	13.08	1.68	22.01
Aug. 20	do	do	do	18.0	7.80	1.15	8.95
Sept. 12	do	do	do	17.0	7.31	0.68	4.95
Oct. 1	do	do	do	17.8	8.00	0.51	4.10
" 22	do	do	do	18.8	10.03	0.40	4.02
Nov. 13	do	do	do	19.1	10.36	0.35	3.64
Sept. 16	C. Chambers	Callum Creek...	N.E. 36-11-2-5...	7.7	3.70	0.95	3.54
Oct. 4	do	Connelly Creek...	N.W. 34-7-2-5...	8.0	2.45	0.56	1.38
July 30	do	Spring Creek...	S.E. 23-13-2-5...	2.5	0.66	0.40	0.27
" 3	A. W. P. Lowrie	Drum Creek...	Sec. 20-7-3-5...	6.8	2.03	0.88	1.78
June 8	do	Elton's Ditch...	N.E. 19-8-1-5...	0			0.09
Jan. 23	N. McL. Sutherland	Fortier S. Spring...	S.E. 17-7-1-5...	0			0.004
Feb. 3	do	do	do	0			0.009
" 16	do	do	do	0			0.016
" 29	do	do	do	0			0.010
Mar. 15	do	do	do	0			0.007
April 24	do	Fortier N. Spring...	do	0			0.028
" 24	do	Fortier S. Spring...	do	0			0.020
May 27	A. W. P. Lowrie	Fortier N. Spring...	do	0			0.012
May 27	do	Fortier S. Spring...	S.E. 17-7-1-5...	0			0.008
June 18	do	Fortier S. Spring...	do	0			0.002
" 18	do	Fortier N. Spring...	do	0			0.010
July 9	do	Fortier S. Spring...	do	0			0.002
" 9	do	Fortier N. Spring...	do	0			0.006
Sept. 11	do	Fortier S. Spring...	do	0			0.007
" 11	do	Fortier N. Spring...	do	0			0.004
" 27	do	do	do	0			0.004
" 27	do	Fortier S. Spring...	do	0			0.006
Dec. 12	do	do	do	0			0.004
" 21	do	Fortier S. Spring...	do	0			0.003
April 27	N. McL. Sutherland	Gold Creek...	Sec. 30-7-5-5...	21.5	15.84	1.64	25.93
May 30	A. W. P. Lowrie	do	do	21.5	19.00	2.46	46.68
June 22	do	do	do	21.5	21.93	2.97	65.23
July 31	do	do	do	22.6	23.32	3.10	72.38
Aug. 20	do	do	do	21.5	15.84	1.64	25.93
Sept. 14	do	do	do	22.0	16.92	1.44	24.40
Oct. 1	do	do	do	21.5	15.11	1.24	18.72
April 27	N. McL. Sutherland	Lyon Creek...	Sec. 39-7-4-5...	10.1	7.61	2.03	15.43
May 28	A. W. P. Lowrie	do	do	14.0	10.05	2.31	23.21
July 9	C. Chambers	Menice Spring...	N.W. 30-13-2-5...	3.6	2.29	0.80	1.82
July 30	P. J. Jennings	Mountain Stream...	S.W. 21-7-3-5...	0			0.40
Jan. 8	N. M. Sutherland	McGillivray Creek...	N.E. 7-8-4-5...	3.7	1.40	0.67	0.94
Jan. 25	do	do	do	5.6	1.15	0.71	0.82
Mar. 19	do	do	do	5.2	2.26	0.72	1.63
April 1	do	do	do	8.3	3.12	0.77	2.41
" 30	do	do	do	16.5	12.81	1.56	19.95
May 30	A. W. P. Lowrie	do	do	16.8	12.49	1.89	23.58
June 22	do	do	do	13.0	9.79	2.07	20.27
July 12	do	do	do	18.6	11.01	1.87	20.58
Aug. 1	do	do	do	18.7	11.06	1.30	14.38
Sept. 13	do	do	do	17.7	7.50	0.90	6.80
Oct. 2	do	do	do	15.4	5.68	0.67	3.79
" 23	do	do	do	16.4	6.13	0.61	3.74
Nov. 15	do	do	do	15.2	6.16	0.57	3.50
Nov. 28	do	do	do	15.5	7.02	0.29	2.05
Dec. 9	H. O. Brown	do	do	15.5	9.93	0.60	5.98
" 23	do	do	do	15.0	5.82	0.74	4.34
Feb. 8	N. M. Sutherland	Nez-Perce Creek...	Sec. 17-8-4-5...	7.0	4.80	0.37	1.74
" 20	do	do	do	3.4	0.89	0.84	0.75
Mar. 1	do	do	do	4.5	1.14	0.71	0.80
April 30	do	do	do	3.5	0.72	0.82	0.59
May 30	A. W. P. Lowrie	do	do	14.8	8.62	1.33	11.44
June 22	do	do	do	13.8	10.45	0.83	8.64
July 12	do	do	do	13.3	8.67	0.79	6.83
Aug. 1	do	do	do	13.2	9.71	0.83	8.09
Aug. 22	do	do	do	6.4	3.51	1.56	5.49
Sept. 13	do	do	do	7.0	2.91	1.21	3.51
Oct. 2	do	do	do	5.9	2.61	0.69	1.80
Oct. 23	do	do	do	6.30	2.25	0.61	1.37
Nov. 15	do	do	do	6.4	2.09	0.56	1.18
" 28	H. O. Brown	do	do	6.2	2.30	1.19	2.73
Dec. 9	do	do	do	4.3	2.67	0.86	2.29
" 23	do	do	do	5.0	2.41	0.60	1.45
Sept. 16	C. Chambers	Playle Creek...	S.W. 32-11-1-5...	5.7	1.72	0.62	1.17
Oct. 15	do	Fincher Creek...	N.W. 13-5-1-5...	0			0.48
" 19	do	do	S.E. 21-6-30-4...	37.6	28.91	0.61	17.7
				30.0	25.20	0.93	23.33

① Weir measurements.

NOTE.—Width is the actual width of water surface, not including piers. Area of section is the total area of the measured section, including both moving and still water.

SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Oldman River drainage basin, in 1912.  
Continued.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. feet.	Ft. per Sec.	Sec.-ft.
May 8.....	A. W. P. Lowrie.	Spring Creek.....	S.E. 34-13-29-4..	2.0	0.43	1.23	0.53
" 8.....	do	Spring Creek (Br.).	do	①			0.01
June 5.....	do	Spring Creek.....	do	①			0.14
" 5.....	do	Spring Cr. (ab. B.)	do	2.0	0.32	0.62	0.20
" 5.....	do	do (bel. B.)	do	2.0	0.31	0.71	0.22
" 27.....	do	do (Br.).	do	①			0.008
" 27.....	do	do	do	①			0.02
" 27.....	do	Spring Creek.....	do	①			0.22
July 5.....	C. Chambers....	do	N.E. 27-13-1-5..	3.5	1.76	0.41	0.72
" 16.....	do	do	S.E. 34-13-29-4..	3.3	0.64	0.59	0.38
" 23.....	A.W. P. Lowrie.	do	do	①			0.33
" 23.....	do	Spring Cr. (Br.)...	do	①			0.05
Aug. 10.....	C. Chambers....	Spring Creek.....	N.E. 9-15-1-5..	①			0.19
" 10.....	do	do	S.E. 9-15-1-5..	①			0.36
" 27.....	do	do	N.E. 27-13-29-4..	①			0.02
" 28.....	A.W. P. Lowrie.	do	S.E. 34-13-29-4..	①			0.33
Sept. 19.....	do	Spring Creek (Br.).	do	①			0.02
" 19.....	do	do	do	①			0.02
" 5.....	C. Chambers....	Spring Creek.....	do	①			0.33
" 5.....	do	Spring (No. 2).....	N.W. 35-11-30-4..	①			0.008
" 5.....	do	Spring (No. 3).....	do	①			0.02
" 5.....	do	Spring (No. 4).....	do	①			0.03
" 5.....	do	Spring (No. 1).....	do	①			0.004
" 6.....	do	Spring.....	S.E. 23-12-30-4..	①			0.08
" 7.....	do	Spring No. 1.....	N.W. 26-11-30-4..	①			0.046
" 9.....	do	Spring No. 4.....	S.E. 35-11-30-4..	①			0.022
" 9.....	do	Spring No. 3.....	N.E. 26-11-30-4..	①			0.022
" 9.....	do	Spring No. 2.....	do	①			0.017
" 5.....	do	Spring No. 2.....	N.E. 2-12-30-4..	①			0.027
" 5.....	do	Spring No. 1.....	do	①			0.022
" 16.....	do	Spring Creek.....	N.E. 25-11-2-5..	①			0.12
Oct. 7.....	do	do	S.W. 25-6-3-5..	①			0.076
" 11.....	do	do	S.E. 17-7-1-5..	①			0.017
June 27.....	do	Sorrel Horse Cr....	N.E. 26-13-30-4..	3.5	0.93	0.75	0.71
July 19.....	do	Thompson Creek...	S.W. 16-13-2-5..	14.4	20.62	1.08	22.35
Oct. 1.....	do	Todd Creek.....	S.E. 11-9-2-5..	11.0	6.40	1.45	9.27
May 10.....	A. W. P. Lowrie.	Willow Creek.....	S.W. 36-12-28-4..	92.0	161.00	1.63	175.00
June 7.....	do	do	do	89.0	134.00	0.85	114.00
Aug. 29.....	do	do	do	86.5	93.25	0.91	84.82
Sept. 20.....	do	do	do	87.2	89.31	0.76	68.29
Oct. 7.....	do	do	do	88.3	90.63	0.74	66.72
Nov. 5.....	do	do	do	88.4	94.04	1.30	72.2
July 9.....	C. Chambers....	Westropp Creek....	N.W. 30-13-2-5..	13.5	14.24	2.02	28.78
Nov. 21.....	do	do	N.E. 35-13-3-5..	11.8	6.07	0.61	3.73
April 27.....	N.M. Sutherland	York Creek.....	Sec. 34-7-4-5..	27.0	23.90	1.86	44.43
May 28.....	A. W. P. Lowrie.	do	do	23.0	18.63	2.13	33.96
June 20.....	do	do	do	22.1	16.09	1.74	28.03
July 11.....	do	do	do	22.8	17.70	2.09	37.04
" 31.....	do	do	do	20.8	12.31	1.34	16.51
Aug. 20.....	do	do	do	19.7	9.77	0.88	8.58
Sept. 12.....	do	do	do	17.0	7.31	0.68	4.95
Oct. 1.....	do	do	do	19.0	8.93	0.45	3.94
" 22.....	do	do	do	19.8	10.60	0.50	5.28
Nov. 13.....	do	do	do	20.0	11.4	0.52	5.90

① Weir measurements.

NOTE.—Width is the actual width of water surface, not including piers. Area of section is the total area of the measured section, including both moving and still water.

## WATERTON RIVER DRAINAGE BASIN.

*General Description.*

Waterton River rises in the northwestern portion of the State of Montana, on the eastern slope of the Rocky Mountains. It flows in a northerly direction and, passing through a chain of lakes near the international boundary, known as Waterton Lakes, it continues in a north and easterly direction and finally empties into Belly River near Stand Off, Alberta.

The topography of the basin is of a varied character, ranging from the mountainous regions of Montana to the rolling prairie of Southern Alberta. The tributaries are mostly in the upper portion of the basin, near the international boundary and from the west side.

There is a large snow-fall in the upper portion of the basin, and the melting of this, combined with heavy rains, often causes big floods on this river in the early summer. Thereafter the river steadily decreases in volume, until the minimum is reached about mid-winter.

Waterton Lakes offer a very favourable site for a storage reservoir, approximately fourteen miles long and one mile wide. The steep, rocky banks of the narrows is an ideal site for the construction of a dam. The flow could be more than doubled during the summer months and used for irrigation purposes, or a power project could easily be developed.

## WATERTON RIVER AT WATERTON MILLS.

This station was established on August 26, 1908, by P. M. Sauder. It is located on the N.E.  $\frac{1}{4}$  Sec. 8, Tp. 2, Rge. 29, W. 4th Mer., about 250 feet below the river's outlet from the Lower Waterton Lake.

The gauge, which is a plain staff graduated to feet and hundredths, is placed in a stilling box at the right bank. The zero (elev. 90.51) is referred to a permanent iron bench mark (assumed elev. 100.00), situated within six feet of the gauge.

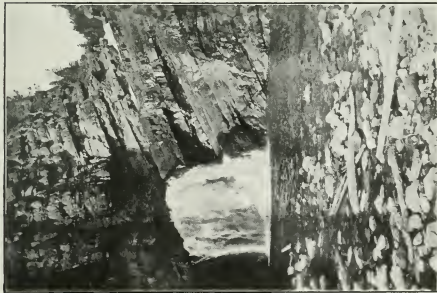
The channel is wide and straight for 250 feet above and 400 feet below the station. Both banks are high, slightly wooded and will not overflow. The bed of the stream is rough and rocky but is not liable to shift. The current is always rather swift at mid-stream.

Discharge measurements are made from a cable car during high stages. In low water the stream can be waded almost across, the deep channel in the centre being taken from the cable car. The heavy winds which blow frequently affect the measurements. The points for soundings are marked by a tagged wire stretched above the cable.

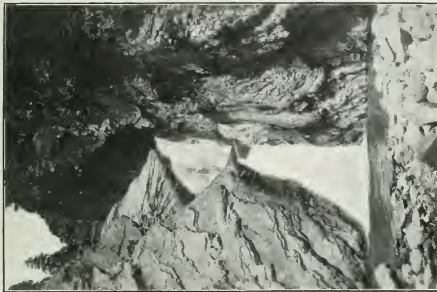
During 1911 and 1912, the gauge was read by H. H. Hanson.

## DISCHARGE MEASUREMENTS of Waterton River at Waterton Mills, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
April 26.....	L. J. Gleeson.....	283	419.5	2.43	3.40	1,019.6
May 27.....	do .....	302	438.1	3.24	3.62	1,318.7
June 14.....	do .....	297	850.7	4.64	4.85	3,946.0
July 6.....	do .....	292	520.3	3.01	3.75	1,594.3
July 27.....	do .....	286	340.6	2.30	3.18	784.7
Aug. 22.....	do .....	285	289.4	1.99	3.01	576.6
Oct. 22.....	do .....	230	199.8	1.76	2.70	351.4
1912.						
Mar. 6.....	D. D. McLeod.....	53.0	628	1.16	2.10	73.5
May 1.....	L. J. Gleeson.....	279.0	225	1.85	3.27	417.2
May 17.....	do .....	298.0	632	3.79	4.36	2,394.3
June 12.....	do .....	298.0	586	3.54	4.34	2,081.2
July 13.....	do .....	300.0	523	2.72	3.95	1,422.5
July 31.....	V. Meek.....	289.7	372	2.25	3.55	837.2
Aug. 17.....	do .....	113.0	195	2.41	3.10	471.3
Sept. 16.....	do .....	228.0	206	1.39	2.90	287.6
Oct. 15.....	G. F. Deas.....	220.0	184	1.37	2.81	252.0
Nov. 8.....	V. Meek.....	220.0	224	1.35	2.97	302.3
Nov. 29.....	do .....	200.0	196	1.45	2.91	285.6
Dec. 16.....	do .....	220.0	224	1.29	2.97	302.3



Cameron Falls on Oil Creek near Waterton Mills, Alberta.  
Taken by G. F. Deas.



Hell Roaring Canyon near Waterton Mills, Alberta.  
Taken by G. F. Deas.





SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Waterton River at Waterton Mills, for 1911

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			3.50	1,180	4.23	2,440	4.01	1,999
2.....			3.48	1,154	4.18	2,338	3.96	1,908
3.....			3.46	1,128	4.48	3,022	3.91	1,818
4.....			3.46	1,128	4.58	3,270	3.86	1,732
5.....			3.48	1,154	4.69	3,554	3.78	1,598
6.....			3.58	1,250	4.58	3,270	3.73	1,518
7.....			3.78	1,598	4.56	3,220	3.70	1,470
8.....			3.78	1,598	4.48	3,022	3.67	1,425
9.....			3.77	1,582	4.56	3,220	3.61	1,335
10.....			3.76	1,566	4.61	3,346	3.61	1,335
11.....			3.76	1,566	4.68	3,528	3.55	1,250
12.....			3.76	1,566	4.71	3,607	3.50	1,180
13.....			3.71	1,486	4.81	3,878	3.43	1,089
14.....			3.71	1,486	4.83	3,934	3.39	1,038
15.....			3.75	1,550	4.89	4,102	3.37	1,014
16.....			3.78	1,598	4.82	3,906	3.34	978
17.....			4.18	2,338	4.76	3,742	3.33	966
18.....			4.28	2,556	4.68	3,528	3.33	966
19.....	2.53	285	4.48	3,022	4.60	3,320	3.32	954
20.....	2.55	295	4.48	3,022	4.50	3,070	3.28	908
21.....	2.62	332	4.23	2,446	4.42	2,878	3.24	864
22.....	2.78	436	3.98	1,944	4.38	2,784	3.24	864
23.....	2.88	514	3.76	1,566	4.34	2,692	3.22	842
24.....	3.09	710	3.73	1,518	4.40	2,830	3.20	820
25.....	3.23	853	3.71	1,486	4.46	2,974	3.18	800
26.....	3.36	1,002	3.69	1,455	4.36	2,738	3.16	780
27.....	3.37	1,014	3.66	1,410	4.22	2,424	3.16	780
28.....	4.38	2,784	3.70	1,470	4.17	2,317	3.13	750
29.....	4.46	2,974	3.79	1,614	4.09	2,151	3.10	720
30.....	3.53	1,222	3.88	1,766	4.05	2,075	3.14	760
31.....			3.98	1,944			3.12	740

DAILY GAUGE-HEIGHT AND DISCHARGE of Waterton River at Waterton Mills, for 1911.—Con.

	August		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.11	730	2.74	408	3.18	800	2.18	134
2.....	3.12	740	2.72	394	3.16	780	2.18	134
3.....	3.14	760	3.03	650	3.13	750	2.18	134
4.....	3.16	780	3.63	1,365	3.11	730	2.16	128
5.....	3.23	853	3.56	1,264	3.08	700	.....	.....
6.....	3.30	930	3.68	1,440	3.03	650	.....	.....
7.....	3.39	1,038	3.72	1,502	2.97	593	.....	.....
8.....	3.41	1,063	3.78	1,598	2.96	584	.....	.....
9.....	3.43	1,089	3.77	1,582	2.91	539	.....	.....
10.....	3.42	1,076	3.73	1,518	2.88	514	.....	.....
11.....	3.41	1,063	3.78	1,598	2.87	506	.....	.....
12.....	3.37	1,014	3.82	1,664	2.86	498	.....	.....
13.....	3.33	966	3.88	1,766	2.84	482	.....	.....
14.....	3.28	908	3.91	1,818	2.82	466	.....	.....
15.....	3.22	842	3.86	1,732	2.84	482	.....	.....
16.....	3.18	800	3.68	1,440	2.83	474	.....	.....
17.....	3.13	750	3.68	1,440	2.82	466	.....	.....
18.....	3.09	710	3.66	1,410	2.81	458	.....	.....
19.....	3.07	690	3.64	1,380	2.80	450	.....	.....
20.....	3.05	670	3.65	1,395	2.79	443	.....	.....
21.....	3.02	640	3.63	1,365	2.78	436	.....	.....
22.....	2.98	602	3.48	1,154	2.68	368	.....	.....
23.....	2.93	557	3.44	1,102	2.62	332	.....	.....
24.....	2.90	530	3.38	1,026	2.58	310	.....	.....
25.....	2.88	514	3.38	1,026	2.48	260	.....	.....
26.....	2.86	498	3.36	1,002	2.46	250	.....	.....
27.....	2.84	482	3.33	966	2.40	220	.....	.....
28.....	2.82	466	3.29	919	2.38	212	.....	.....
29.....	2.80	450	3.26	886	2.23	152	.....	.....
30.....	2.78	436	3.23	853	2.19	137	.....	.....
31.....	2.76	422	.....	.....	2.18	134	.....	.....

SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Waterton River at Waterton Mills, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1...	2.28	130	3.20	470	2.10	110	2.29	131	3.27	533	4.12	1,742
2...	2.25	126	3.16	438	2.10	110	2.31	133	3.28	542	4.09	1,681
3...	2.23	124	3.12	406	2.10	110	2.37	142	3.29	551	4.06	1,624
4...	2.20	120	3.09	383	2.10	110	2.43	151	3.30	560	4.06	1,624
5...	2.15	115	3.03	341	2.10	110	2.47	157	3.31	570	4.05	1,605
6...	2.09	109	3.00	320	2.10	110	2.51	164	3.31	570	4.04	1,586
7...	1.97	97	2.98	310	2.10	110	2.49	160	3.37	630	4.03	1,567
8...	1.88	88	2.97	305	2.10	110	2.52	166	3.45	716	4.05	1,605
9...	1.86	86	2.94	290	2.09	109	2.56	173	3.53	811	4.14	1,784
10...	1.84	84	2.90	270	2.09	109	2.62	184	3.61	918	4.23	1,976
11...	1.80	80	2.85	250	2.09	109	2.89	266	3.69	1,026	4.33	2,199
12...	1.78	78	2.82	238	2.09	109	3.01	327	3.74	1,098	4.35	2,245
13...	1.90	90	2.80	230	2.09	109	3.10	390	3.81	1,300	4.32	2,176
14...	2.50	162	2.70	200	2.09	109	3.13	414	3.96	1,442	4.28	2,086
15...	2.93	285	2.60	180	2.10	110	3.11	422	4.10	1,700	4.25	2,020
16...	2.93	285	2.45	154	2.10	110	3.15	430	4.22	1,954	4.22	1,954
17...	2.92	280	2.10	110	2.11	111	3.16	438	4.35	2,245	4.18	1,868
18...	2.91	275	2.13	113	2.11	111	3.17	446	4.47	2,535	4.13	1,763
19...	2.91	275	2.17	117	2.10	110	3.19	462	4.38	2,314	4.10	1,700
20...	2.91	275	2.18	118	2.10	110	3.21	479	4.37	2,291	4.11	1,721
21...	2.90	270	2.20	120	2.10	110	3.22	488	4.35	2,245	4.11	1,721
22...	2.90	270	2.18	118	2.10	110	3.23	497	4.32	2,176	4.12	1,742
23...	2.96	300	2.16	116	2.10	110	3.24	506	4.28	2,086	4.11	1,721
24...	3.00	320	2.15	115	2.10	110	3.25	515	4.26	2,042	4.09	1,681
25...	3.05	355	2.15	115	2.10	110	3.26	524	4.27	2,064	4.07	1,643
26...	3.12	406	2.15	115	2.13	113	3.29	551	4.27	2,064	4.02	1,548
27...	3.20	470	2.14	114	2.15	115	3.30	560	4.28	2,086	4.00	1,510
28...	3.23	497	2.14	114	2.17	117	3.30	560	4.29	2,108	3.97	1,459
29...	3.27	533	2.12	112	2.22	122	3.29	551	4.24	1,998	3.94	1,408
30...	3.29	551	...	...	2.27	128	3.28	542	4.20	1,910	3.91	1,357
31...	3.20	470	...	...	2.28	130	...	...	4.15	1,805	...	...

## DAILY GAUGE-HEIGHT AND DISCHARGE of Waterton River at Waterton Mills, for 1912

	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.92	1,374	3.52	799	2.87	258	2.82	238	3.09	383	2.85	250
2.....	3.93	1,391	3.50	775	2.86	254	2.82	238	3.07	369	2.82	238
3.....	3.92	1,374	3.48	752	2.85	250	2.81	234	3.04	348	2.82	238
4.....	3.88	1,310	3.46	729	2.85	250	2.80	230	3.02	334	2.79	227
5.....	3.83	1,231	3.44	706	2.89	266	2.80	230	3.00	320	2.77	221
6.....	3.78	1,156	3.42	683	2.89	266	2.79	227	2.93	285	2.75	215
7.....	3.76	1,127	3.37	630	2.88	262	2.79	227	2.94	290	2.73	209
8.....	3.74	1,098	3.33	590	2.89	266	2.78	224	2.96	300	2.75	215
9.....	3.86	1,278	3.29	550	2.90	270	2.83	242	3.13	414	2.75	215
10.....	3.90	1,340	3.26	524	2.90	270	2.86	254	3.14	422	2.74	212
11.....	3.92	1,374	3.24	506	2.91	275	2.88	262	3.17	446	2.73	209
12.....	3.95	1,425	3.21	479	2.92	280	3.08	376	3.12	406	2.68	196
13.....	3.96	1,442	3.18	454	2.93	285	2.84	246	3.18	454	2.64	188
14.....	3.93	1,391	3.15	430	2.95	295	2.82	238	3.15	430	2.59	178
15.....	3.91	1,357	3.11	398	2.93	285	2.81	234	3.17	446	2.54	169
16.....	3.89	1,324	3.11	398	2.92	280	2.80	230	3.20	470	2.62	184
17.....	3.85	1,163	3.10	390	2.91	275	2.86	254	3.16	438	2.53	167
18.....	3.80	1,185	3.08	376	2.90	270	2.96	300	3.12	406	2.44	152
19.....	3.74	1,098	3.06	362	2.98	310	3.10	390	3.06	362	2.43	151
20.....	3.73	1,083	3.04	348	2.91	275	3.23	497	3.12	406	2.40	146
21.....	3.76	1,127	3.02	334	2.91	275	3.22	488	3.10	390	2.38	143
22.....	3.79	1,170	3.00	320	2.91	275	3.21	479	3.00	320	2.43	151
23.....	3.83	1,231	2.99	315	2.91	275	3.22	488	3.03	341	2.43	151
24.....	3.80	1,185	2.98	310	2.93	285	3.21	479	2.94	290	2.46	156
25.....	3.77	1,141	2.95	295	2.93	285	3.19	462	2.94	290	2.49	160
26.....	3.75	1,112	2.92	280	2.91	275	3.17	446	3.34	600	2.52	166
27.....	3.73	1,083	2.91	275	2.88	262	3.15	430	3.01	327	2.47	157
28.....	3.71	1,054	2.90	270	2.86	254	3.12	406	2.96	300	2.42	149
29.....	3.66	986	2.89	266	2.83	242	3.12	406	2.91	275	2.37	142
30.....	3.61	918	2.88	262	2.83	242	3.11	398	2.88	262	2.32	135
31.....	3.55	835	2.87	258			3.10	390			2.26	127

## SESSIONAL PAPER No. 25d

## MONTHLY DISCHARGE of Waterton River at Waterton Mills, for 1911-12.

(Drainage area 238 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
<b>1911</b>						
April (19-30).....	2,974	285	1,035	4.52	2.01	24,592
May.....	3,022	1,128	1,650	6.93	7.99	191,458
June.....	4,102	2,075	3,106	13.0	14.56	184,807
July.....	1,999	720	1,136	4.77	5.50	69,553
August.....	1,089	422	744	3.12	3.60	45,748
September.....	1,818	394	1,255	5.27	5.88	74,672
October.....	800	134	457	1.92	2.21	28,101
November (1-4).....	134	128	1.32	0.555	0.08	1,047
The period.....					41.83	530,278
<b>1912</b>						
January.....	551	78	245	1.03	1.19	15,064
February.....	470	110	217	0.913	0.98	12,482
March.....	130	109	112	0.470	0.54	6,887
April.....	560	131	364	1.53	1.71	21,660
May.....	2,535	533	1,509	6.34	7.31	92,789
June.....	2,245	1,357	1,744	7.33	8.18	103,776
July.....	1,442	835	1,205	5.07	5.84	74,062
August.....	799	258	454	1.91	2.20	27,915
September.....	310	242	270	1.14	1.27	16,066
October.....	497	224	330	1.39	1.60	20,290
November.....	600	262	371	1.56	1.74	22,076
December.....	250	127	181	0.761	0.88	11,129
The year.....					33.44	424,226

## CROOKED CREEK NEAR WATERTON MILLS.

This station was established September 15, 1909, by H. C. Ritchie. It was at first located on the S.E.  $\frac{1}{4}$  Sec. 22, Tp. 2, Rge. 29, W. 4th Mer., but, as an observer could not be secured at this point, it was moved on June 15, 1911, by L. J. Gleeson to a point 250 feet from Ernest Allred's house on the S.W.  $\frac{1}{4}$  Sec. 23, Tp. 2, Rge. 29, W. 4th Mer. It was again moved on October 15, 1912, by G. F. Deas, to S. W.  $\frac{1}{4}$  Sec. 22, Tp. 2, Rge. 29, W. 4th Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is securely fastened to the right bank. The zero (elev. 88.20) is referred to a bench mark (assumed elev. 100.00) on the right bank. All gauge heights and measurements for 1911 and 1912 are referred to the gauge on the S.W.  $\frac{1}{4}$  Sec. 23, Tp. 2, Rge. 29, W. 4th Mer. The zero of this gauge (elev. 91.86) is referred to two nail-heads in a post (assumed elev. 100.00) situated ten feet south of the gauge.

The stream flows in one channel at all stages. It is straight for fifty feet above and one hundred feet below the station. The right bank is clean and not liable to overflow. The left bank is covered with brush and may overflow in extreme high water.

Discharge measurements are made by wading thirty feet downstream from the gauge. The initial point for soundings is at a stump of a small tree on the left bank. During flood periods the stream cannot be waded at this point but gaugings can be made at a bridge about one and a half miles downstream.

During 1911, the gauge was read by Ernest Allred, and during 1912 by Ernest Allred and Frank Rowe.

## DISCHARGE MEASUREMENTS of Crooked Creek, near Waterton Mills, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1191.						
May 29....	L. J. Gleeson	19.4	25 3	3.63	2.50	92.2
June 13....	do	16.4	15 0	2.50	1.87	37.6
July 8....	do	11.7	12.5	1.20	1.36	15.0
July 29....	do	12.3	6 9	0.98	1.15	6 7
Aug. 24....	do	12.5	10 3	1.48	1.46	15.4
Sept. 17....	do	14.0	22.3	2.31	2.15	51.7
Oct. 22....	do	13.2	12.2	1.55	1.57	19.1
1912						
May 2....	L. J. Gleeson	15.5	9.7	1.40	1.45	13.6
May 16....	do	16.0	9.1	1.41	1.40	12.9
June 11....	do	15.3	9.1	1.45	1.40	13.2
July 11....	do	13.6	12.0	1.46	1.60	17.5
July 30....	V. Meek	15.7	6.6	1.36	1.29	9.0
Aug. 15....	do	15.2	4 8	0.98	1.09	4.7
Sept. 5....	do	10.0	5 4	0.75	1.02	4.0
Oct. 15....	G. F. Deas	15.0	11.6	0.59	1.15	6.9
Nov. 8....	V. Meek	16.8	9.1	0.86	1.23	7.8

## DAILY GAUGE-HEIGHT AND DISCHARGE of Crooked Creek, near Waterton Mills, for 1911.—Con.

DAY.	May.		June.		July		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			2 15	55	2 20	50	1 40	13 0
2			2 15①	55	2 03①	45	1 62①	21
3			2 15	55	1 87①	34	1 85	33
4			2 11	51	1.70	25	1 92①	37
5			2 06①	47	1 60①	20	2.00	43
6			2 02	44	1 50	16 3	2 42①	83
7			2 03①	45	1 48①	15 6	2 85	134
8			2 04	46	1 45	14 6	3 00	132
9			1 97①	41	1 40①	13 0	3 10	164
10			1.90	36	1 35①	11.6	2 85	134
11			1 89①	35	1 30	10 3	2 40	80
12			1 88①	35	1 30①	10.3	2.20	59
13			1 87	34	1 30	10 3	2.00	43
14			1 88①	35	1 30①	10 3	1.75	28
15			1.89	35	1.30	10.3	1.70	25
16			1 85①	33	1 35①	11 6	1.70	25
17			1 81	31	1 41①	13 3	1 65	23
18			1 76①	28	1 46	15 0	1 60	20
19			1 70①	25	1 38①	12 5	1 50	16 3
20			1 65	23	1 30	10 3	1.50	16.3
21			1 65①	23	1 30①	10.3	1 50	16 3
22			1 65	23	1 30	10 3	1 55	18.3
23			1 66①	23	1 28①	9 8	1 50	16 3
24			1 66	23	1 27①	9 6	1 50	16 3
25			1 74①	27	1 25	9 2	1 50	16 3
26			1 82①	31	1 24①	8 9	1 71	26
27			1 90	36	1 23	8 7	2 00	43
28			1 85①	33	1 22①	8 5	1.50	16 3
29			1 80	30	1 21	8 2	1 50	16.3
30			2 44	85	1 27①	9 6	1 46	15.0
31			2.30	69	1 34①	11 4	1 44	14.3

① Interpolated.

Discharges over 92.2 sec.-ft. are estimated.

① No gauge heights read before May 29.

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Crooked Creek, near Waterton Mills, for 1911.—*Con.*

DAY.	September.		October.		November.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge	Height.	charge	Height.	charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1...	1.44	14.3	1.70	25	2.10	50
2...	1.40	13.0	1.80	30	1.70	25
3...	1.50	16.3	2.00	43	1.60	20
4...	4.50	332	2.00	43	1.50	16.3
5...	4.50	332	1.90	36	1.43	14.0
6...	3.50	212	1.70	25	1.35	11.6
7...	3.50	212	1.70	25	1.35	11.6
8...	3.50	212	1.68	24	1.50	16.3
9...	3.50	212	1.60	20	1.90	36
10...	2.90	140	1.60	20	1.90	36
11...	2.90	140	1.59	19.9	1.90	36
12...	2.90	140	1.59	19.9	2.00	43
13...	2.50	92	1.55	18.3	2.00	43
14...	2.50	92	1.50	16.3	2.00	43
15...	2.48	90	1.50	16.3	2.00	43
16...	2.30	69	1.50	16.3	.....	.....
17...	2.30	69	1.50	16.3	.....	.....
18...	2.48	90	1.50	16.3	.....	.....
19...	2.10	50	1.50	16.3	.....	.....
20...	2.10	50	1.50	16.3	.....	.....
21...	2.10	50	1.50	16.3	.....	.....
22...	2.20	59	1.50	16.3	.....	.....
23...	2.15	55	1.50	16.3	.....	.....
24...	2.20	59	1.50	16.3	.....	.....
25...	2.20	59	1.50	16.3	.....	.....
26...	2.00	43	2.00	43.0	.....	.....
27...	1.90	36	1.55	18.3	.....	.....
28...	1.88	35	1.55	18.3	.....	.....
29...	1.70	25	1.50	16.3	.....	.....
30...	1.70	25	1.47	15.3	.....	.....
31...	.....	.....	1.47	15.3	.....	.....

Discharges over 92.2 sec.-ft. are estimated.



## DAILY GAUGE-HEIGHT AND DISCHARGE of Crooked Creek, near Waterton Mills, for 1912.

DAY.	April.		May.		June.		July.		August.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.70	116.0	1.61	21.0	1.69	25.0	1.80	30.0	1.14	6.6	1.22	8.5
2.....	2.60	104	1.58	19.5	1.65	23	1.88	35	1.14	6.6	1.22	8.5
3.....	2.40	80	1.59	19.9	1.60	20	1.80	30	1.16	7.1	1.16	7.1
4.....	2.16	55	1.62	21.0	1.59	19.9	1.70	25	1.35	11.6	1.15	6.8
5.....	1.75	28	1.65	23	1.56	18.7	1.50	16.3	1.16	7.1	1.12	6.2
6.....	1.70	25	1.65	23	1.56	18.7	1.40	13.0	1.14	6.6	1.16	7.1
7.....	1.40	13	1.64	22	1.53	17.5	1.33	11.1	1.14	6.6	1.14	6.6
8.....	1.63	22	1.60	20	1.50	16.3	2.20	59.0	1.11	5.9	1.22	8.5
9.....	1.69	25	1.58	19.5	1.45	14.6	2.22	61	1.10	5.7	1.47	15.2
10.....	1.72	26	1.55	18.3	1.43	14.0	1.70	25	1.10	5.7	1.35	11.6
11.....	2.09	49	1.50	16.3	1.40	13	1.61	21	1.10	5.7	1.36	11.9
12.....	1.84	32	1.49	16.0	1.40	13	1.61	21	1.10	5.7	1.37	12.2
13.....	1.60	20	1.50	16.3	1.40	13	1.60	20	1.10	5.7	1.39	12.7
14.....	1.49	16.0	1.50	16.3	1.39	12.7	1.85	33	1.10	5.7	1.61	21.0
15.....	1.61	21.0	1.48	15.6	1.40	13.0	1.84	32.0	1.09	5.5	1.51	16.7
16.....	1.59	19.9	1.48	15.6	1.60	20.0	1.45	14.6	1.18	7.5	1.36	11.9
17.....	1.65	23.0	1.40	13.0	1.43	14.0	1.45	14.6	1.10	5.7	1.33	11.1
18.....	1.64	22	1.40	13.0	1.41	13.3	1.45	14.6	1.09	5.5	1.31	10.6
19.....	1.65	23	1.44	14.3	1.39	12.7	1.44	14.3	1.09	5.5	1.30	10.3
20.....	1.57	19.1	2.00	43.0	1.33	11.1	1.60	20.0	1.08	5.3	1.27	9.6
21.....	1.56	18.7	2.69	115	1.29	10.1	1.85	33	1.08	5.3	1.27	9.6
22.....	1.55	18.3	2.59	103	1.26	9.4	1.84	32	1.01	3.7	1.23	8.7
23.....	1.55	18.3	2.19	58	1.26	9.4	1.79	30.0	1.00	3.5	1.21	8.2
24.....	1.60	20.0	2.05	46	1.26	9.4	1.55	18.3	1.00	3.5	1.20	8.0
25.....	1.60	20.0	1.90	36	1.24	8.9	1.46	15.0	.99	3.3	1.21	8.2
26.....	1.59	19.9	1.90	36	1.21	8.2	1.44	14.3	.99	3.3	1.22	8.5
27.....	1.58	19.5	1.88	35	1.21	8.2	1.33	11.1	.99	3.3	1.23	8.7
28.....	1.57	19.1	1.85	33	1.19	7.8	1.29	10.1	.99	3.3	1.26	9.4
29.....	1.56	18.7	1.82	31	1.19	7.8	1.29	10.1	.98	3.1	1.23	8.7
30.....	1.53	17.5	1.79	30	1.65	23.0	1.19	7.8	.98	3.1	1.22	8.5
31.....			1.70	25			1.14	6.6	.99	3.3		

No observations during September and October.  
Discharges over 92.2 sec.-ft. are estimated.

## MONTHLY DISCHARGE of Crooked Creek, near Waterton Mills, for 1911-12.

(Drainage area 20 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Persquare Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
May (29-31).....	92	69.0	82.0	4.10	0.46	488
June.....	55	23.0	36.0	1.80	2.01	2,142
July.....	59	8.2	15.2	0.76	0.88	935
August.....	164	13.0	44.0	2.29	2.54	2,705
September.....	332	13.0	101.0	5.05	5.63	6,010
October.....	43	15.3	21.6	1.08	1.24	1,328
November (1-15).....	43	11.6	29.7	1.48	0.82	884
The period.....					13.58	14,492
1912.						
April.....	116	13.0	31.0	1.55	1.73	1,845
May.....	115	13.0	30.1	1.50	1.73	1,851
June.....	25	7.8	14.2	0.71	0.79	845
July.....	61	6.6	22.5	1.12	1.29	1,384
August.....	11.6	3.1	5.4	0.27	0.31	329
① November.....	21	6.2	10.0	0.50	0.56	595
The period.....					6.41	6,849

① No records were obtained during September and October.

## BELLY RIVER DRAINAGE BASIN.

*General Description.*

Belly River rises near Chief Mountain in Northern Montana. The main stream is augmented on the United States side of the boundary line by Middle Fork and on the Canadian side by North Fork. From the junction with North Fork on Sec. 21, Tp. 1, Rge. 28, W. 4th Mer., the river flows in a winding, but northeasterly course until it is joined by Oldman River in Sec. 27, Tp. 9, Rge. 23, W. 4th Mer., where it turns southeasterly, and after making a loop flows in a north and easterly direction until it joins Bow River in Sec. 27, Tp. 11, Rge. 13, W. 4th Mer. and forms the South Saskatchewan River.

The topography of the basin is of the most varied character, ranging from the mountainous regions of Montana, the rolling prairie and foothills at the boundary to the level prairie from Lethbridge to the junction with Bow River. The upper tributaries drain a forested region, but the main stream flows through a deep valley with many clumps of large whitewood on its banks.

There is an abundant snow-fall in the upper portion of the basin, but the precipitation diminishes into semi-arid conditions near Lethbridge. At first Belly River is a comparatively clear stream, but soon after crossing the boundary line it gradually becomes turbid, especially at the times of high water. The greater portion of the sediment is caused by the washing away of banks and cutting of new channels. Freshets caused by melting snow and heavy rains are frequent in the summer. The maximum flow usually occurs in June or July and after that the flow gradually decreases until it reaches the minimum in January or February.

As yet very little use has been made of the water in this basin. In the upper regions, where water could easily be diverted, it is not required for irrigation purposes and further downstream it would be an expensive undertaking.

There are a couple of small private irrigation schemes diverting water from Belly River, and the city of Lethbridge receives its domestic supply from the same source.

The Canadian Pacific Railway Company have located and may construct a canal from Belly River to supply their irrigation system, if St. Mary River is found deficient. A survey and estimate of the cost of this proposed canal were made by the government during 1912, and a copy of the report may be found in the report of the Commissioner of Irrigation for 1912. There are also a number of feasible power sites in the upper regions which will no doubt be developed when there is a market.

## BELLY RIVER NEAR MOUNTAIN VIEW.

This station was established on November 1, 1911, by H. R. Carscallen. It is situated in the N.E.  $\frac{1}{4}$  Sec. 5, Tp. 2, Rge. 23, W. 4th Mer., and is six miles southwest of Mountain View P.O.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to a post sunk in the bed of the stream at the right bank. The zero (elev. 88.16) is referred to a permanent iron bench mark (assumed elev. 100.00), situated beneath the centre of the cable support on the right bank.

The channel is straight for 250 feet above the station and for 350 feet below. The bed is composed of gravel and sand. The right bank is high, slightly wooded and will not overflow except during extreme high water. The left bank is low, quite well wooded, and will overflow.

Discharge measurements are made from a cable car, by means of a current meter and stay wire. The initial point for soundings is a spike driven into the downstream cable support on the left bank, and the points for soundings are marked by red paint on a measuring wire.

During 1911 and 1912, the gauge was read by J. N. West.

## DISCHARGE MEASUREMENTS of Belly River, near Mountain View, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
Nov. 1	L. J. Gleeson	86	212.2	0.88	2.075	187.6
Nov. 20	do	93	197.95	0.65	2.39	128.09
Dec. 10	D. D. MacLeod	83	168.86	0.603	2.01	101.82
1912.						
Jan. 19	D. D. MacLeod	79	121.4	0.85	1.95	101.8
Feb. 7	do	80	122.2	0.44	1.74	54.2
Feb. 18	do	83	131.7	0.41	1.62	54.3
Mar. 5	do	82	122.7	0.39	1.73	47.4
Mar. 23	do	82	108.6	0.41	1.53	44.5
April 13	I. J. Gleeson	87	219.8	1.02	2.13	223.9
April 30	do	86	225.0	1.24	2.22	279.6
May 16	do	97	350.7	2.79	3.30	979.8
June 11	do	98	316.6	2.56	3.18	810.2
June 27	do	94	306.0	2.40	3.09	733.5
July 9	do	95	275.9	2.06	2.87	569.0
July 29	V. Meek	92	262.2	1.76	2.66	461.4
Aug. 14	do	88	220.9	1.25	2.26	277.5
Sept. 5	do	86	204.5	0.96	2.04	196.4
Oct. 13	G. F. Deas	60	65.2	2.07	1.87	135.1
Nov. 6	V. Meek	64	70.4	2.15	1.97	151.0
Nov. 30	do	62	69.5	1.41	1.95	97.92
Dec. 17	do	65	75.0	.97	1.93	72.54

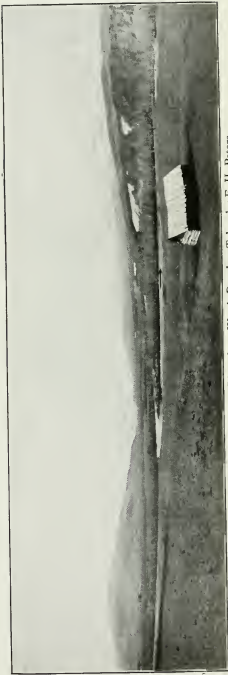
## DAILY GAUGE-HEIGHT AND DISCHARGE of Belly River, near Mountain View, for 1911.

DAY.	November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	2.06	200	2.08	101
2	1.94	168	2.00	93
3	1.94	168	2.00	93
4	1.93	155	1.98	92
5	1.90	145	1.97	92
6	1.85	132	1.92	85
7	1.92	152	1.63	51
8	1.92	152	1.93	89
9	2.20	158	1.70	61
10	2.27	164	1.68	60
11	2.40	179	1.66	57
12	2.48	185	2.00	100
13	2.50	181	1.98	98
14	2.57	185	1.95	93
15	2.65	188	1.96	95
16	2.73	192	1.98	98
17	2.62	172	2.00	100
18	2.51	153	1.85	81
19	2.45	141	1.86	82
20	2.39	128	1.83	79
21	2.30	118	1.80	75
22	2.13	101	1.95	93
23	2.29	118	1.87	84
24	2.04	92	1.80	75
25	2.13	104	1.85	81
26	2.04	94	1.95	93
27	1.90	79	2.03	105
28	2.00	90	2.05	107
29	2.08	100	2.10	113
30	2.12	105	2.20	126
31			2.15	120

November 9 to Dec. 31 ice conditions.



Cable Station on Belly River at West's Ranch. Taken by F. H. Peters.



Looking up the Valley of Belly River from West's Ranch. Taken by F. H. Peters.



SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE OF Belly River, near Mountain View, for 1912.—Continued.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.10	112	1.75	63	1.65	42	1.67	88	2.24	269	2.96	632
2.....	2.00	107	1.77	65	1.60	36	1.72	99	2.27	281	2.95	625
3.....	1.95	97	1.78	65	1.74	52	2.12	222	2.24	269	2.95	625
4.....	1.91	92	1.72	56	1.73	49	1.97	168	2.22	261	2.92	604
5.....	1.90	92	1.60	39	1.73	47	1.86	134	2.22	261	2.92	604
6.....	1.80	79	1.63	41	.....	①.....	1.82	123	2.20	253	2.90	590
7.....	1.80	79	1.74	54	.....	.....	1.92	152	2.22	261	2.86	565
8.....	1.75	73	1.70	50	.....	.....	1.87	137	2.38	327	2.92	604
9.....	1.60	54	1.65	46	.....	.....	1.96	165	2.68	464	3.02	677
10.....	1.70	66	1.63	44	.....	.....	2.07	203	2.80	528	3.15	799
11.....	1.85	87	1.64	46	.....	.....	2.18	245	2.82	540	3.17	820
12.....	1.68	75	1.63	47	.....	.....	2.16	237	2.85	559	3.19	841
13.....	1.75	74	1.64	48	.....	.....	2.13	226	2.90	596	3.23	890
14.....	2.02	111	1.65	52	.....	.....	2.12	222	2.94	618	3.27	940
15.....	2.25	144	1.64	52	.....	.....	2.10	214	3.06	712	3.13	778
16.....	2.30	152	1.63	52	.....	.....	2.09	210	3.30	980	3.07	720
17.....	2.20	138	1.60	47	.....	.....	2.09	210	3.45	1,180	2.99	653
18.....	1.95	102	1.62	54	.....	.....	2.10	214	3.36	1,059	2.98	646
19.....	1.90	95	1.60	47	.....	.....	2.11	218	3.41	1,126	2.97	639
20.....	1.96	103	1.58	45	.....	.....	2.10	214	3.32	1,006	3.03	686
21.....	1.94	99	1.56	42	.....	.....	2.08	207	3.40	1,112	3.09	737
22.....	1.92	94	1.54	39	.....	.....	2.06	210	3.24	903	3.13	778
23.....	1.90	92	1.56	40	1.53	44	2.10	214	3.12	767	3.17	820
24.....	1.83	81	1.53	36	1.47	42	2.13	234	3.09	737	3.18	831
25.....	1.80	75	1.58	41	1.50	46	2.16	237	3.07	720	3.19	841
26.....	1.86	83	1.60	42	1.55	57	2.17	241	3.07	720	3.16	810
27.....	1.76	71	1.58	39	1.50	54	2.18	245	3.02	677	3.13	778
28.....	1.79	74	1.56	35	1.60	68	2.20	253	3.33	1,020	3.07	720
29.....	1.75	67	1.53	32	1.50	58	2.21	257	3.17	820	2.93	611
30.....	1.72	62	.....	.....	1.47	58	2.22	261	3.12	767	3.03	686
31.....	1.76	65	.....	.....	1.50	62	.....	.....	3.07	720	.....	.....

Jan. 1 to Apr. 1 ice conditions.

① River frozen to bottom of gauge; no observations.

DAILY GAUGE-HEIGHT AND DISCHARGE of Belly River, near Mountain View, for 1912.  
*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.03	686	2.59	420	2.12	222	1.86	134	1.92	141	1.98	100
2.....	3.02	677	2.57	410	2.10	214	1.85	132	1.90	135	1.98	100
3.....	2.98	646	2.62	434	2.07	203	1.85	132	1.89	129	1.99	99
4.....	2.97	639	2.58	415	2.05	196	1.96	165	1.87	125	2.03	106
5.....	2.83	547	2.55	402	2.03	189	1.96	165	1.87	124	2.23	128
6.....	2.78	517	2.50	379	2.02	185	1.87	137	1.87	123	2.19	123
7.....	2.76	506	2.42	344	2.03	189	1.87	137	1.88	123	2.13	111
8.....	2.82	540	2.37	322	2.04	192	1.88	140	1.93	135	2.05	95
9.....	2.87	570	2.37	322	2.06	200	1.89	142	1.97	148	1.93	82
10.....	2.88	577	2.37	322	2.06	200	1.92	152	2.16	206	1.83	70
11.....	2.97	639	2.37	322	2.05	196	1.89	142	2.17	205	1.83	68
12.....	2.96	632	2.33	306	2.06	200	1.87	137	2.18	205	1.85	70
13.....	2.93	611	2.30	293	2.06	200	1.87	137	2.16	195	1.86	68
14.....	2.88	577	2.24	269	2.06	200	1.87	135	2.15	191	1.87	70
15.....	2.81	534	2.23	265	2.05	196	1.88	136	2.13	181	1.78	58
16.....	2.77	512	2.23	265	2.05	196	1.88	136	2.09	164	1.83	64
17.....	2.81	534	2.22	261	2.03	189	1.89	137	2.06	153	1.87	65
18.....	2.68	464	2.17	241	1.99	175	1.90	140	2.03	140	1.88	64
19.....	2.63	439	2.15	234	1.97	168	1.90	139	2.01	132	1.89	66
20.....	2.78	517	2.12	222	1.96	165	1.97	160	1.99	124	2.03	81
21.....	2.97	639	2.14	230	1.92	152	2.22	247	1.96	113	2.08	87
22.....	3.03	686	2.15	234	1.93	155	2.30	278	1.93	106	2.08	87
23.....	3.06	712	2.14	230	1.92	152	2.21	242	1.95	109	2.07	85
24.....	3.08	729	2.13	226	1.90	145	2.12	209	1.97	109	2.08	87
25.....	2.99	653	2.22	261	1.90	145	2.02	175	1.95	105	2.13	92
26.....	2.88	577	2.20	253	1.88	140	1.99	163	1.93	100	2.18	98
27.....	2.81	534	2.16	237	1.87	137	1.99	163	1.93	98	2.10	89
28.....	2.77	512	2.12	222	1.87	137	1.98	160	1.93	95	2.08	87
29.....	2.67	459	2.09	210	1.86	134	1.98	160	1.95	97	2.13	92
30.....	2.62	434	2.08	207	1.86	134	1.97	157	1.95	97	2.14	93
31.....	2.60	424	2.07	203	.....	.....	2.02	171	.....	.....	2.28	110

Nov. 24 to Dec. 31 ice conditions.

## SESSIONAL PAPER No. 25d

## MONTHLY DISCHARGE of Belly River, near Mountain View, for 1911-12.

(Drainage area 118 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
November.....	200	79	143	1.21	1.35	8,509
December.....	126	57	89.4	0.758	0.87	5,497
The period.....					2.22	14,006
1912						
January.....	152	54	90.3	0.76	.876	5,552
February.....	65	32	46.9	0.40	.431	2,698
March.....	68	36	51.1	0.43	.224	1,418
April.....	261	88	203.	1.72	1.92	12,079
May.....	1,180	253	661.5	5.60	6.46	40,674
June.....	940	565	718.3	6.09	6.795	42,742
July.....	729	424	511.7	8.84	5.58	35,152
August.....	434	203	289.1	2.45	2.825	17,776
September.....	322	134	176.9	1.50	1.674	10,526
October.....	278	132	160.	1.36	1.568	9,838
November.....	206	95	136.9	1.16	1.294	8,146
December.....	128	64	86.9	.736	.848	5,343
The year.....					30.405	191,944

## MAMI CREEK NEAR MOUNTAIN VIEW.

This station was established on August 13, 1909, by H. C. Ritchie. It is located at the traffic bridge on the road allowance north of the N.E.  $\frac{1}{4}$  Sec. 18, T.p. 2, Rge. 27, W. 4th Mer., and is just below the junction of the east and west branches.

The gauge, which is a plain staff graduated to feet and hundredths, is fastened to a pile supporting the bridge at the left bank. The zero (elev. 90.70) is referred to nail-heads (assumed elev. 100.00) on a pile on the right bank.

The channel is curved for about 100 feet above the bridge and is straight for 200 feet below. Both banks are high, clear of brush, rocky and liable to overflow in extreme high water. The bed of the stream is composed of stones covered with sand and gravel.

Discharge measurements are made during high water from the bridge. In low water the east branch dries up and the west branch is waded just above the junction.

During 1912, the gauge was read by R. W. Herr.

No water was diverted above this station during 1911 or 1912.



## DISCHARGE MEASUREMENTS of Mami Creek, near Mountain View, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
May 24.....	L. J. Gleeson.....	25.4	28.0	1.37	2.39	38.5
June 13.....	do.....	22.6	20.3	0.65	2.11	13.4
July 5.....	do.....	12.1	6.99	1.44	2.01	10.1
July 26.....	do.....	10.4	4.32	0.85	1.84	3.68
Sept. 13.....	do.....	24.3	28.2	1.62	2.46	45.8
1912.						
April 14.....	L. J. Gleeson.....	25.0	21.8	0.91	2.45	19.9
April 29.....	do.....	23.0	20.2	0.64	2.32	13.1
May 15.....	do.....	22.0	18.3	0.58	2.23	10.1
June 10.....	do.....	10.6	4.69	1.06	2.10	4.97
June 27.....	do.....	8.3	2.93	.79	1.95	2.31
July 10.....	do.....	9.4	4.67	1.94	2.28	9.06
July 29.....	V. Meek.....	10.1	3.82	.84	2.08	3.29
Aug. 14.....	do.....	5.7	1.86	.90	2.00	1.67
Sept. 4.....	do.....	6.0	1.54	1.16	2.01	1.78
Oct. 12.....	G. F. Deas.....	6.5	2.85	1.06	2.14	3.03
Nov. 5.....	V. Meek.....	5.8	2.36	.91	2.08	2.15

## DAILY GAUGE-HEIGHT AND DISCHARGE of Mami Creek, near Mountain View, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.50	22.9	2.30	12.1	2.20	8.0	2.00	3.0
2.....	2.60	29.8	2.30	12.1	2.20	8.0	2.10	4.9
3.....	2.60	29.8	2.40	17.1	2.10	4.9	2.10	4.9
4.....	2.60	29.8	2.30	12.1	2.10	4.9	2.10	4.9
5.....	2.50	22.9	2.30	12.1	2.10	4.9	2.10	4.9
6.....	2.70	37.0	2.30	12.1	2.10	4.9	2.10	4.9
7.....	2.40	17.1	2.30	12.1	2.10	4.9	2.10	4.9
8.....	2.40	17.1	2.30	12.1	2.10	4.9	2.20	6.0
9.....	2.40	17.1	2.30	12.1	2.10	4.9	2.20	6.0
10.....	2.40	17.1	2.30	12.1	2.10	4.9	2.10	2.8
11.....	2.50	22.9	2.30	12.1	2.10	4.9	2.10	2.8
12.....	2.50	22.9	2.20	8.0	2.10	4.9	2.20	6.0
13.....	2.50	22.9	2.20	8.0	2.10	4.9	2.20	6.0
14.....	2.40	17.1	2.20	8.0	2.00	3.0	2.20	6.0
15.....	2.40	17.1	2.20	8.0	2.10	4.9	2.10	2.8
16.....	2.40	17.1	2.10	4.9	2.10	4.9	2.10	2.8
17.....	2.40	17.1	2.10	4.9	2.10	4.9	2.10	2.8
18.....	2.40	17.1	2.10	4.9	2.10	4.9	2.10	2.8
19.....	2.40	17.1	2.10	4.9	2.10	4.9	2.10	2.8
20.....	2.40	17.1	2.20	8.0	2.00	3.0	2.10	2.8
21.....	2.40	17.1	2.50	22.9	2.00	3.0	2.20	6.0
22.....	2.30	12.1	2.60	29.8	2.00	3.0	2.10	2.8
23.....	2.30	12.1	2.50	22.9	2.00	3.0	2.10	2.8
24.....	2.30	12.1	2.40	17.1	2.00	3.0	2.10	2.8
25.....	2.30	12.1	2.40	17.1	2.00	3.0	2.10	2.8
26.....	2.30	12.1	2.30	12.1	2.00	3.0	2.10	2.8
27.....	2.30	12.1	2.30	12.1	2.00	3.0	2.10	2.8
28.....	2.30	12.1	2.20	8.0	1.90	1.8	2.20	6.0
29.....	2.30	12.1	2.20	8.0	1.90	1.8	2.20	6.0
30.....	2.30	12.1	2.20	8.0	2.00	3.0	2.20	6.0
31.....			2.20	8.0			2.20	6.0

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Mami Creek, near Mountain View, for 1912.—*Con.*

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2 20	6 0	1 90	1 0	1 90	1 0	2 10	2 8
2.	2 20	6 0	1 90	1 0	1 90	1 0	2 10	2 8
3.	2 20	6 0	1 90	1 0	1 90	1 0	2 10	2 8
4.	2 20	6 0	1 90	1 0	2 00	1 6	2 10	2 8
5.	2 20	6 0	1 90	1 0	2 00	1 6	2 10	2 8
6.	2 20	6 0	1 90	1 0	1 90	1 0	2 00	1 6
7.	2 20	6 0	1 90	1 0	1 90	1 0	2 00	1 6
8.	2 20	6 0	1 90	1 0	1 90	1 0	2 00	1 6
9.	2 20	6 0	1 90	1 0	2 00	1 6	2 00	1 6
10.	2 20	6 0	1 90	1 0	2 00	1 6	2 00	1 6
11.	2 20	6 0	1 90	1 0	2 00	1 6	2 00	1 6
12.	2 10	2 8	1 90	1 0	2 10	2 8	2 00	1 6
13.	2 10	2 8	1 90	1 0	2 10	2 8	2 10	2 8
14.	2 10	2 8	1 90	1 0	2 10	2 8	2 10	2 8
15.	2 10	2 8	1 90	1 0	2 10	2 8	2 10	2 8
16.	2 10	2 8	1 90	1 0	2 10	2 8	.....	.....
17.	2 10	2 8	1 90	1 0	2 10	2 8	.....	.....
18.	2 10	2 8	1 90	1 0	2 10	2 8	.....	.....
19.	2 10	2 8	1 90	1 0	2 10	2 8	.....	.....
20.	2 10	2 8	1 90	1 0	2 10	2 8	.....	.....
21.	2 00	1 6	1 90	1 0	2 10	2 8	.....	.....
22.	2 00	1 6	1 90	1 0	2 20	6 0	.....	.....
23.	2 00	1 6	1 90	1 0	2 20	6 0	.....	.....
24.	2 00	1 6	1 90	1 0	2 20	6 0	.....	.....
25.	1 90	1 0	1 90	1 0	2 20	6 0	.....	.....
26.	1 90	1 0	1 90	1 0	2 20	6 0	.....	.....
27.	1 90	1 0	2 00	1 6	2 20	6 0	.....	.....
28.	1 90	1 0	2 00	1 6	2 20	6 0	.....	.....
29.	1 90	1 0	1 90	1 0	2 20	6 0	.....	.....
30.	1 90	1 0	1 90	1 0	2 20	6 0	.....	.....
31.	1 90	1 0	.....	.....	2 20	6 0	.....	.....

## MONTHLY DISCHARGE of Mami Creek, near Mountain View, for 1912.

(Drainage area 21 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.	37 0	12 1	18 5	0.881	0.98	1,101
May.	29 8	4 9	11 7	0.557	0.64	719
June.	8 0	1 8	4 27	0.203	0.23	254
July.	6 0	2 8	4 14	.197	.23	255
August.	6 0	1 0	3 37	.160	.18	207
September.	1 6	1 0	1 04	.050	.06	62
October.	6 0	1 0	3 29	.157	.18	202
November.	2 8	1 6	2 24	.107	.06	67
The period.	.....	.....	.....	.....	.....	2,867

## CHRISTIANSON DITCH NEAR CALDWELL.

This station was established on September 14, 1911, by L. J. Gleeson. It is situated in the S.E.  $\frac{1}{4}$  of sec. 12, tp. 3, Rge. 8, W. 4th Mer., on Elias Christianson's irrigation ditch. It is six miles northwest of Mountain View and one quarter of a mile south of Big Bend police post.

The gauge, which is a plain staff graduated to feet and tenths, is driven into the channel of the ditch on the line of the gauging section. The zero of the gauge (elev. 96.30) is referred to a bench mark (assumed elev. 100.00), situated on the left bank close to the gauge.

The channel is straight for 300 feet above and 100 feet below the station. The main ditch is about 400 feet long and four feet wide, and has a good fall.

During 1912, the gauge was read by Mrs. Polly Christianson.

No discharge measurements were made during the year, and the daily discharges have therefore not been computed.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Christianson Ditch, near Caldwell, for 1912.

DAY.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1.10	
2.....			1.10	
3.....			1.10	
4.....			1.40	
5.....			1.20	
6.....			1.20	
7.....			1.20	
8.....			1.20	
9.....			1.20	
10.....			1.30	
11.....			1.30	
12.....			1.70	
13.....			1.70	
14.....			1.70	
15.....			1.50	
16.....			1.30	
17.....	1.10		1.30	
18.....	① 1.10		1.30	
19.....			1.30	
20.....			1.30	
21.....			1.50	
22.....			1.50	
23.....			1.50	
24.....			1.50	
25.....			1.30	
26.....			1.40	
27.....			1.80	
28.....			1.50	
29.....			1.50	
30.....			1.50	
31.....	② 1.10		①.....	

① Water turned off.

② Water turned on.

## SESSIONAL PAPER No. 25d

## BELLY RIVER NEAR STAND OFF.

This station was established on May 27th, 1909, by H. C. Ritchie. It is eighteen miles south of the town of Macleod, and is located on the S.E.  $\frac{1}{4}$  Sec. 21, Tp. 6, Rge. 25, W. 4th Mer., 200 yards from George Pearson's house.

The gauge, which is a plain staff graduated to feet and hundredths, is secured by braces to the left bank. The zero (elev. 92.51) is referred to a permanent iron bench mark (assumed elev. 100.00) situated thirty-three feet upstream from the gauge.

For a distance of 75 feet above and 60 feet below the gauge, the channel is straight. The current runs smoothly with a moderate velocity over a bed of clean gravel. Both banks are low, free from brush, and liable to overflow during high stages of the river. Since the establishment of this station the cross-section has changed very little, if any, but owing to the sharp turns in the channel the river is liable to take a new course altogether in times of extreme flood.

Discharge measurements are made during the open season from the traffic bridge on the S.E.  $\frac{1}{4}$  Sec. 21, Tp. 6, Rge. 25, W. 4th Mer., the points of soundings being painted on the lower chord of the superstructure. During the frozen period they are made at or near the gauge.

During 1911 and 1912, the gauge was read by George Pearson.

## DISCHARGE MEASUREMENTS of Belly River, near Stand Off, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft</i>
1911.						
Jan. 3	W. H. Greene	81	71.2	0.637	0.94	45.33
Feb. 13	do	70	85.95	0.883	1.76	75.96
Feb. 23	do	70	162.20	0.842	1.48	136.82
Mar. 25	J. E. Degnan	97	171.18	1.917	1.19	328.23
April 12	do	84	137.54	1.455	.88	200.27
May 3	do	86	195.2	2.081	1.41	406.28
May 30	L. J. Gleeson	97	242.3	2.61	1.64	633.2
June 16	do	106	362.1	4.14	2.54	1,501.1
July 9	do	92	247.2	2.94	1.73	726.5
July 31	do	92	212.4	2.54	1.51	539.7
Aug. 26	do	90	154.7	2.10	1.17	326.6
Sept. 19	do	92	223.2	2.75	1.62	613.2
Nov. 27	N. McL. Sutherland	76	109.62	1.179	.96	129.23
Dec. 12	do	85	107.93	.95	.72	102.43
Dec. 31	do	75	82.15	.92	4.60	75.34
1912.						
Jan. 17	N. McL. Sutherland	65	59.05	1.07	5.05	63.4
Feb. 2	do	65	64.20	1.24	4.68	79.7
Feb. 15	do	76	66.90	1.12	4.53	74.6
Feb. 28	do	55	65.60	.80	4.22	52.3
Mar. 14	do	50	50.20	.85	4.28	42.7
Mar. 27	do	86	205.05	2.70	0	553.05
April 16	do	56	158.80	1.94	1.15	308.80
May 25	L. J. Gleeson	92	256.6	2.99	1.83	766.50
June 15	do	92	269.2	3.58	1.89	863.6
Aug. 2	V. Meek	86	190.6	2.40	1.41	457.2
Aug. 20	do	84	141.5	1.72	1.00	243.9
Sept. 11	do	82	132.1	1.57	.91	208.1
Oct. 18	G. F. Deas	84	122.2	1.21	.83	148.9
Nov. 11	V. Meek	84	150.0	1.76	1.12	264.8
Nov. 18	A. W. P. Lowile	83	146.0	1.49	.95	217.9
Dec. 3	H. O. Brown	84	164.7	.854	.93	140.7

## DAILY GAUGE-HEIGHT AND DISCHARGE of Belly River, near Stand Off, for 1911.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.90	40	1.45	60	1.50	138	1.00	239	1.45	487	2.10	1,051
2.....	0.90	40	1.64	71	1.55	142	.85	168	1.45	487	2.40	1,349
3.....	0.94	45	1.60	70	1.53	139	.80	145	1.45	487	2.75	1,733
4.....	0.95	45	1.43	56	1.56	143	.90	192	1.45	487	2.93	1,943
5.....	1.10	58	1.43	53	1.59	149	.95	216	1.55	561	2.65	1,618
6.....	1.10	56	1.43	52	1.59	149	1.00	239	1.65	642	2.45	1,400
7.....	1.25	67	1.44	53	1.58	148	.90	192	2.00	954	2.25	1,198
8.....	1.25	65	1.46	56	1.58	148	.85	168	2.05	1,002	2.20	1,148
9.....	1.24	65	1.63	66	1.63	153	.85	168	1.93	888	2.20	1,148
10.....	1.25	65	1.63	66	1.84	180	.90	192	1.90	859	2.30	1,248
11.....	1.25	63	1.64	68	2.00	201	.95	216	1.90	859	2.40	1,349
12.....	1.25	60	1.69	70	1.55	142	.90	192	1.85	814	2.55	1,506
13.....	1.25	59	1.76	76	1.55	142	.90	192	1.83	796	2.65	1,618
14.....	1.25	58	1.69	79	2.00	201	.85	168	1.90	859	2.70	1,675
15.....	1.25	57	1.65	82	2.40	255	.85	168	3.05	2,087	2.68	1,652
16.....	1.25	57	1.45	82	2.50	1,452	.75	122	3.35	2,466	2.65	1,618
17.....	1.25	56	1.55	92	2.60	1,560	.90	192	3.20	2,275	2.60	1,560
18.....	1.24	53	1.45	90	3.50	2,662	.95	216	2.94	1,955	2.55	1,506
19.....	1.24	52	1.46	100	①	.....	.95	216	2.70	1,675	2.40	1,349
20.....	1.24	52	1.43	102	.....	.....	.95	216	2.50	1,452	2.40	1,349
21.....	1.90	98	1.44	112	.....	.....	1.05	263	2.36	1,309	2.40	1,349
22.....	1.90	98	1.46	122	.....	.....	1.30	394	2.00	954	2.35	1,298
23.....	1.85	92	1.45	130	①	.....	1.35	424	2.05	1,002	2.40	1,349
24.....	1.85	91	1.49	135	1.30	394	1.36	429	2.02	973	2.70	1,675
25.....	1.35	58	1.45	129	1.28	383	1.45	487	1.95	906	3.00	2,025
26.....	1.35	57	1.50	138	.94	211	1.65	642	1.93	888	2.65	1,618
27.....	1.35	56	1.45	130	.94	211	1.70	683	1.91	868	2.50	1,452
28.....	1.35	55	1.47	132	.85	168	1.70	683	1.89	850	2.40	1,349
29.....	1.30	53	.....	.....	.93	206	1.55	561	1.89	850	2.35	1,298
30.....	1.25	50	.....	.....	1.10	287	1.55	561	1.85	814	2.25	1,198
31.....	1.45	60	.....	.....	1.06	268	.....	.....	1.85	814	.....	.....

① Gauge destroyed on March 19 and replaced on March 24.

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Belly River, near Stand Off, for 1911.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.10	1,051	1.47	501	1.10	287	1.26	372	.76	126	1.01	134
2.....	2.00	954	1.47	501	1.11	292	1.24	361	.76	126	1.01	134
3.....	1.90	849	1.47	501	2.16	1,109	1.21	344	.76	126	.99	132
4.....	1.85	814	1.57	577	2.51	1,463	1.21	344	.76	126	.96	129
5.....	1.80	769	1.47	501	3.11	2,162	1.20	339	①	.....	.96	129
6.....	1.80	769	1.47	501	3.11	2,162	1.19	334	.....	.....	.96	129
7.....	1.80	769	1.72	700	3.11	2,162	1.16	318	.....	.....	.96	129
8.....	1.78	752	2.02	973	3.01	2,037	1.13	303	.....	.....	.96	129
9.....	1.75	726	2.02	973	2.75	1,733	1.11	292	.....	.....	.96	129
10.....	1.70	683	1.92	878	2.26	1,208	1.09	282	.....	.....	.96	129
11.....	1.65	642	1.87	832	2.11	1,061	1.07	273	.....	.....	.96	129
12.....	1.60	601	1.77	743	2.06	1,012	1.07	273	.....	.....	.76	107
13.....	1.55	561	1.72	700	2.05	1,002	1.06	268	.....	.....	.76	107
14.....	1.50	521	1.61	658	2.01	964	1.06	268	.....	.....	.....	①
15.....	1.40	453	1.67	658	1.96	916	1.06	268	.....	.....	.....	.....
16.....	1.40	453	1.52	537	1.91	968	1.06	268	.....	.....	.....	.....
17.....	1.40	453	1.47	501	1.86	823	1.05	263	.....	.....	.....	.....
18.....	1.60	601	1.46	494	1.76	735	1.04	258	.....	.....	.....	.....
19.....	1.60	601	1.46	494	1.71	692	1.04	258	.....	.....	.....	.....
20.....	1.60	601	1.46	494	1.68	667	1.03	253	.....	.....	.....	.....
21.....	1.60	601	1.42	467	1.66	650	1.03	253	.....	.....	.....	.....
22.....	1.55	561	1.37	435	1.61	609	1.02	249	.....	.....	.....	.....
23.....	1.55	561	1.32	406	1.59	593	.94	211	.....	.....	.....	.....
24.....	1.55	561	1.27	378	1.56	569	.93	206	.....	.....	.....	.....
25.....	1.55	561	1.22	350	1.56	569	.92	201	.....	.....	.....	.....
26.....	1.55	561	1.17	323	1.51	529	.92	201	.....	.....	.....	.....
27.....	1.55	561	1.15	313	1.41	460	.92	201	.96	129	.....	.....
28.....	1.55	561	1.13	303	1.36	429	.91	197	.96	129	.....	.....
29.....	1.55	561	1.11	292	1.31	400	.91	197	.96	129	.....	.....
30.....	1.55	561	1.10	287	1.31	400	.90	192	.96	132	.....	.....
31.....	1.57	577	1.10	287	.....	.....	.89	187	.....	.....	.....	.....

①: River frozen to bottom of rod. No gauge heights read.

②: No gauge heights read.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Belly River, near Stand Off, for 1912

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.66	79	4.80	85	4.25	54	.....	.....	1.10	287	1.89	850
2.....	4.66	79	4.68	80	4.25	54	.....	.....	1.10	287	1.85	814
3.....	4.65	78	4.70	81	4.25	54	.....	.....	1.10	287	1.85	814
4.....	4.65	78	4.80	87	4.25	54	.....	.....	1.10	287	1.85	814
5.....	4.65	78	4.70	81	4.25	54	.....	.....	1.10	287	1.88	841
6.....	4.65	78	4.68	80	4.25	54	.....	.....	1.10	287	1.80	769
7.....	4.65	78	4.68	80	4.30	57	.....	.....	1.15	313	1.79	760
8.....	4.66	79	4.68	80	4.30	57	.....	.....	1.10	287	1.75	726
9.....	4.66	79	4.70	81	4.30	57	.....	.....	1.10	287	1.75	726
10.....	4.65	78	4.70	81	4.30	57	.....	.....	1.35	424	1.75	726
11.....	4.66	79	4.74	83	4.30	57	.....	.....	1.45	487	1.79	760
12.....	4.66	79	4.75	84	4.30	57	.....	.....	1.65	642	1.85	814
13.....	4.66	79	4.70	81	4.30	57	.....	.....	1.65	642	1.90	859
14.....	4.66	79	4.70	81	4.28	56	.....	.....	2.05	1,002	1.90	859
15.....	4.65	78	4.71	82	4.32	58	.....	.....	2.15	1,100	2.00	954
16.....	4.66	79	4.70	81	4.30	57	1.15	① 313	2.40	1,349	1.95	909
17.....	5.05	63	4.70	81	4.30	57	1.15	313	2.50	1,452	1.95	906
18.....	5.15	73	4.70	81	4.31	58	1.15	313	2.45	1,400	1.92	878
19.....	5.15	75	4.48	68	4.32	58	1.15	313	2.55	1,506	1.90	859
20.....	5.00	68	4.50	69	4.33	59	1.15	313	2.50	1,452	1.90	859
21.....	5.00	64	4.50	69	4.36	61	1.13	303	2.60	1,560	1.89	850
22.....	4.80	61	4.48	68	4.33	59	1.12	297	2.60	1,560	1.89	850
23.....	5.00	75	4.50	69	4.39	62	1.10	287	2.55	1,506	1.90	859
24.....	5.00	78	4.50	69	4.30	57	1.10	287	2.50	1,452	1.95	906
25.....	5.00	80	4.55	72	①	.....	1.10	287	1.89	850	1.95	906
26.....	5.05	86	4.50	69	.....	.....	1.10	287	1.90	859	2.00	954
27.....	5.05	88	4.35	60	.....	.....	1.10	287	2.10	1,051	2.00	954
28.....	4.90	81	4.22	52	.....	.....	1.10	287	2.05	1,002	2.00	954
29.....	4.90	84	4.25	54	.....	.....	1.10	287	2.00	954	1.95	906
30.....	4.90	87	.....	.....	.....	.....	1.10	287	2.00	954	1.95	906
31.....	4.80	83	.....	.....	.....	.....	.....	.....	1.90	859	.....	.....

Gauge height for Jan., Feb. and Mar. taken from rod upstream.

① Ice went out carrying away gauge.

② Rod re-established.

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Belly River, near Stand Off, for 1912.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1.95	906	1.50	521	0.90	192	0.79	140	1.14	308	①	
2	1.90	859	1.45	487	0.90	192	0.79	140	1.14	308		
3	1.85	814	1.45	487	0.90	192	0.79	140	1.09	282		
4	1.85	814	1.45	487	0.85	168	0.77	131	1.09	282		
5	1.85	814	1.40	453	0.85	168	0.77	131	0.94	211		
6	1.80	769	1.40	453	0.85	168	0.77	131	0.89	187		
7	1.65	642	1.35	424	0.85	168	0.74	117	0.79	140		
8	1.65	642	1.30	394	0.85	168	0.74	117	0.79	140		
9	1.60	601	1.25	366	0.85	168	0.77	131	0.69	93		
10	1.55	561	1.25	366	0.85	168	0.79	140	0.69	93		
11	1.55	561	1.20	339	0.88	183	0.79	140	0.99	234		
12	1.55	561	1.20	339	0.88	183	0.81	150	1.09	282		
13	1.60	601	1.15	313	0.88	183	0.81	150	1.09	282		
14	1.65	642	1.15	313	0.88	183	0.84	164	1.19	334		
15	1.75	726	1.10	287	0.87	178	0.89	187	1.24	361		
16	1.65	642	1.10	287	0.87	178	0.89	187	1.24	361		
17	1.65	642	1.05	263	0.87	178	0.99	234	1.24	361		
18	1.65	642	1.05	263	0.87	178	1.04	258	1.24	361		
19	1.55	561	1.05	263	0.86	173	1.09	282	1.17	323		
20	1.55	561	1.05	263	0.86	173	1.09	282	1.12	297		
21	1.65	642	1.05	263	0.86	173	1.09	282	1.07	273		
22	1.65	642	1.05	263	0.86	173	1.14	308	1.07	273		
23	1.75	726	1.05	263	0.86	173	1.14	308	1.02	249		
24	1.80	769	1.00	239	0.84	164	1.19	334	1.02	249		
25	1.80	769	1.00	239	0.84	164	1.19	334	0.97	225		
26	1.75	726	1.00	239	0.84	164	1.19	334	0.97	225		
27	1.70	683	0.95	216	0.82	154	1.24	361	0.92	201		
28	1.65	642	0.95	216	0.79	140	1.26	372	0.87	178		
29	1.65	642	0.95	216	0.79	140	1.26	372	0.87	178		
30	1.55	561	0.95	216	0.79	140	1.19	334	0.87	178		
31	1.55	561	0.95	216			1.19	334				

① No gauge heights read in December.



## MONTHLY DISCHARGE of Belly River, near Stand Off, for 1911-12.

(Drainage area 461 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911.						
January.....	98	40	60.7	0.131	0.15	3,732
February.....	138	52	88.3	0.192	0.20	4,904
March (1-18 and 24-31).....	2,662	138	394	0.855	0.83	20,295
April.....	653	122	298	0.646	0.72	17,732
May.....	2,466	487	1,043	2.26	2.61	64,105
June.....	2,025	1,051	1,454	3.15	3.51	86,537
July.....	1,015	453	641	1.39	1.60	39,414
August.....	973	287	534	1.16	1.34	32,834
September.....	2,162	287	955	2.07	2.31	56,826
October.....	372	187	266	0.577	.66	16,356
November (1-4 and 27-30).....	132	126	128	0.278	.08	2,029
December (1-13).....	134	107	127	0.275	.13	3,265
The year.....					14.14	348,020
1912.						
January.....	88	61	78	0.169	0.19	4,796
February.....	85	52	75	0.163	0.18	4,314
March (1-24).....	62	54	57	0.124	0.11	2,707
April (16-30).....	313	287	297	0.645	0.36	8,836
May.....	1,560	287	860	1.86	2.14	52,879
June.....	954	726	831	1.85	2.06	50,638
July.....	906	561	675	1.46	1.68	41,504
August.....	521	216	321	0.696	0.80	19,738
September.....	192	140	171	0.371	0.41	10,175
October.....	372	117	227	0.492	0.57	13,958
November.....	361	93	249	0.540	0.60	14,817
The period.....					9.10	224,362

## BELLY RIVER NEAR LETHBRIDGE.

This station was established on August 31, 1911, by A. W. P. Lowrie. It is located on the traffic bridge on the N.-W.  $\frac{1}{4}$  Sec. 1, Tp. 9, Rge. 22, W. 4th Mer., and is about two and a half miles from Lethbridge Post Office.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to the second pier from the east end of the bridge: The zero of the gauge (elev. 87.82) is referred to a bench mark (assumed elev. 100.00) on the west face of the east pier.

The channel is straight for 800 feet above and 2,000 feet below the station. The right bank is not very high and might overflow in the flood stage of the stream. The left bank is low and is liable to overflow during very high water. The bed of the stream is composed of sand and gravel but is not liable to shift.

Discharge measurements are made from the downstream side of the bridge. The initial point of soundings is near the west end of the bridge and distances are marked on the hand rail with white paint.

During 1911 and 1912, the gauge was read by William Bedster.

SESSIONAL PAPER No. 25d

## DISCHARGE MEASUREMENTS of Belly River, near Lethbridge, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
April 6.....	L. J. Gleeson.....	243.6	1,080	1.25	0.40	1,355
May 9.....	do.....	476.6	2,844	2.92	4.04	8,300
May 27.....	A. W. P. Lowrie.....	458.9	2,994	3.27	5.09	9,814
June 15.....	do.....	573.6	3,947	4.96	6.44	19,593
July 5.....	do.....	449.0	2,960	2.90	3.96	8,605
July 21.....	do.....	372.0	2,044	2.01	2.26	4,051
Aug. 16.....	do.....	378.1	2,298	2.31	2.84	5,297
Aug. 31.....	do.....	353.5	1,734	1.57	1.28	2,719
Oct. 25.....	do.....	388.0	1,672	1.43	1.21	2,389
Dec. 6.....	D. D. McLeod.....	200.0	1,288	1.27	0.75	1,632
1912						
Jan. 8.....	D. D. MacLeod.....		1,093	0.92	1.10	1,002.6
Jan. 31.....	do.....	295	1,125	0.80	1.20	1,003.0
Feb. 16.....	do.....	282	998.2	0.83	0.85	828.4
Feb. 28.....	do.....	295	1,066.6	0.75	.48	801.1
Mar. 21.....	do.....	295	921.6	0.797	.41	734.5
April 2.....	do.....	368	2,123.15	2.16	2.35	4,606.18
April 18.....	N. McL. Sutherland.....	372.5	1,930.65	1.85	1.72	3,387.17
May 15.....	A. W. P. Lowrie.....	393.2	2,343.5	2.915	3.48	7,543.00
June 10.....	do.....	293.2	2,543.38	2.73	3.32	6,936.93
July 1.....	do.....	390.8	2,496.32	2.64	3.26	6,588.0
July 15.....	do.....	415.2	2,693.5	2.84	3.65	7,653.74
Aug. 10.....	do.....	364.5	1,979.75	1.76	1.73	3,485.2
Aug. 31.....	do.....	338.0	1,503.8	1.21	0.52	1,833.14
Sept. 23.....	do.....	336.0	1,464.85	1.14	.48	1,671.22
Oct. 12.....	do.....	337.2	1,506.5	1.26	.49	1,906.0
Oct. 31.....	do.....	334.5	1,487.0	1.07	.48	1,598.3
Nov. 29.....	do.....	346.2	1,594.0	1.30	.88	2,072.03
Nov. 29.....	V. Meek.....	327.0	1,462.8	.99	.41	1,444.4
Dec. 11.....	do.....	333.0	1,397.0	.70	.26	97.52

## DAILY GAUGE-HEIGHT AND DISCHARGE of Belly River, near Lethbridge, for 1911.

DAY.	September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.11	2,238	2.26	4,070	0.70	1,725	0.73	1,762
2.....	1.02	2,125	2.23	4,010	0.69	1,712	0.79	1,838
3.....	1.15	2,288	2.24	4,030	0.72	1,750	0.85	1,912
4.....	1.41	2,665	2.40	4,350	0.95	2,038	0.76	1,800
5.....	6.92	22,050	2.20	3,950	0.96	2,050	0.68	1,700
6.....	6.84	21,650	2.02	3,580	0.93	2,012	0.68	1,700
7.....	6.63	20,600	1.91	3,415	0.71	1,738	0.69	1,712
8.....	5.82	16,550	1.81	3,265	①	.....	0.50	1,475
9.....	5.50	14,950	1.70	3,100	①	.....	0.45	1,412
10.....	5.10	13,150	1.62	2,980	①	.....	0.45	1,412
11.....	4.83	11,970	1.50	2,800	①	.....	.....	.....
12.....	4.92	12,340	1.44	2,710	①	.....	.....	.....
13.....	4.81	11,890	1.41	2,666	①	.....	.....	.....
14.....	4.55	10,850	1.40	2,650	①	.....	.....	.....
15.....	4.25	9,650	1.38	2,620	①	.....	.....	.....
16.....	3.95	8,575	1.43	2,695	0.90	1,975	.....	.....
17.....	3.75	7,875	1.50	2,800	0.93	2,012	.....	.....
18.....	3.54	7,220	1.46	2,740	1.20	2,350	.....	.....
19.....	3.26	6,380	1.35	2,575	1.25	2,425	.....	.....
20.....	3.05	5,825	1.32	2,530	1.26	2,440	.....	.....
21.....	3.05	5,825	1.28	2,470	1.28	2,470	.....	.....
22.....	3.10	5,950	1.29	2,485	1.28	2,470	.....	.....
23.....	3.04	5,800	1.24	2,410	1.30	2,500	.....	.....
24.....	3.02	5,750	1.23	2,395	1.16	2,300	.....	.....
25.....	2.95	5,575	1.24	2,410	1.17	2,312	.....	.....
26.....	2.76	5,100	1.07	2,188	1.17	2,312	.....	.....
27.....	2.83	5,275	0.85	1,912	1.14	2,275	.....	.....
28.....	2.62	4,790	0.87	1,938	1.14	2,275	.....	.....
29.....	2.45	4,450	0.95	2,038	0.99	2,088	.....	.....
30.....	2.36	4,270	1.02	2,125	0.71	1,738	.....	.....
31.....	.....	.....	0.92	2,000	.....	.....	.....	.....

①, Water below the gauge.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Belly River, near Lethbridge, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.08	954	1.19	987	0.35	735	2.00	3,910	1.91	3,730	3.90	8,420
2.....	1.08	954	1.10	960	0.35	735	2.30	4,510	1.85	3,620	3.73	7,893
3.....	1.10	960	1.05	945	0.30	720	2.10	4,110	1.85	3,620	3.60	7,510
4.....	1.20	990	1.05	945	0.26	708	2.18	4,270	1.96	3,830	3.55	7,370
5.....	1.20	990	1.06	948	0.28	714	2.15	4,210	1.95	3,810	3.43	7,048
6.....	1.20	990	1.05	945	0.28	714	1.65	3,275	1.85	3,620	3.36	6,866
7.....	1.20	990	0.96	918	0.29	717	1.23	2,568	1.85	3,620	3.25	6,580
8.....	1.16	978	0.95	915	0.30	720	1.02	2,250	1.84	3,602	3.20	6,450
9.....	1.13	969	0.95	915	0.34	732	1.24	2,584	2.24	4,390	3.20	6,450
10.....	1.08	954	0.94	912	0.38	744	1.39	2,833	2.84	5,608	3.36	6,766
11.....	1.04	942	0.93	909	0.30	720	1.70	3,360	3.10	6,200	3.44	7,074
12.....	1.01	933	0.94	912	0.33	729	2.17	4,250	3.09	6,177	3.55	7,370
13.....	1.00	930	0.96	918	0.35	735	2.49	4,890	3.11	6,225	3.58	7,454
14.....	1.00	930	0.94	913	0.35	735	2.15	4,210	3.20	6,450	3.70	7,800
15.....	1.02	936	0.91	903	0.38	744	1.82	3,566	3.46	7,126	3.84	8,234
16.....	1.03	939	0.85	885	0.40	750	1.72	3,394	3.75	7,955	3.83	8,203
17.....	1.03	939	0.90	900	0.41	753	1.74	3,428	4.84	11,854	5.50	14,810
18.....	1.05	945	0.95	915	0.40	750	1.74	3,428	4.64	11,046	4.84	11,854
19.....	1.06	948	1.00	930	0.40	750	1.79	3,513	4.61	10,929	4.43	10,258
20.....	1.09	957	1.03	939	0.41	753	1.84	3,602	4.50	10,510	4.10	9,080
21.....	1.11	963	0.94	912	0.41	753	1.79	3,513	4.74	11,444	3.91	8,455
22.....	1.11	963	0.85	885	0.40	750	1.76	3,462	5.10	12,970	3.80	8,110
23.....	1.14	972	0.75	855	0.55	795	1.78	3,496	4.95	12,305	3.72	7,862
24.....	1.16	978	0.75	855	1.55	3,105	1.78	3,496	4.77	11,567	3.65	7,655
25.....	1.17	981	0.73	849	1.84	3,602	1.85	3,620	4.52	10,586	3.61	7,539
26.....	1.17	981	0.63	819	3.19	6,425	1.95	3,810	4.47	10,402	3.44	7,074
27.....	1.18	984	0.52	786	2.53	4,970	1.90	3,710	4.43	10,258	3.35	6,840
28.....	1.18	984	0.45	765	3.15	6,325	1.87	3,656	4.65	11,085	3.24	6,554
29.....	1.18	984	0.41	753	3.24	6,554	1.88	3,674	4.54	10,662	3.17	6,375
30.....	1.19	987	.....	.....	2.44	4,790	1.90	3,710	4.30	9,790	3.20	6,450
31.....	1.20	990	.....	.....	1.65	3,275	.....	.....	4.21	9,466	.....	.....

© Ice conditions Jan. 1 to Mar. 23.

## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Belly River, near Lethbridge, for 1912.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.27	6,632	2.40	4,710	0.53	1,653	0.25	1,385	0.81	1,982	.....	.....
2.....	3.56	7,398	2.28	4,470	0.49	1,610	0.22	1,358	0.78	1,946	.....	.....
3.....	3.60	7,510	2.24	4,390	0.51	1,631	0.18	1,322	0.73	1,886	.....	.....
4.....	3.65	7,655	2.26	4,430	0.50	1,620	0.20	1,340	0.70	1,850	.....	.....
5.....	3.48	7,178	2.55	5,010	0.59	1,710	0.20	1,340	0.66	1,802	.....	.....
6.....	3.14	6,300	2.35	4,610	0.58	1,708	0.25	1,385	0.53	1,653	.....	.....
7.....	2.92	5,786	2.10	4,110	0.58	1,708	0.24	1,376	0.47	1,590	.....	.....
8.....	3.00	5,970	1.94	3,790	0.74	1,898	0.24	1,376	0.45	1,570	.....	.....
9.....	3.03	6,039	1.76	3,462	0.66	1,802	0.50	1,620	0.47	1,590	.....	.....
10.....	3.61	7,539	1.74	3,428	0.70	1,850	0.52	1,642	0.56	1,686	.....	.....
11.....	3.55	7,370	1.58	3,156	0.60	1,730	0.49	1,610	0.73	1,886	0.26	①.....
12.....	3.55	7,370	1.72	3,394	0.58	1,708	0.49	1,610	0.85	2,030	0.24	.....
13.....	3.58	7,454	1.60	3,190	0.53	1,653	0.47	1,590	0.85	2,030	0.30	.....
14.....	3.66	7,684	1.40	2,850	0.50	1,620	0.46	1,580	0.87	2,054	0.45	.....
15.....	3.80	8,110	1.32	2,714	0.50	1,620	0.47	1,590	0.83	2,006	0.63	.....
16.....	3.73	7,893	1.40	2,850	0.52	1,642	0.45	1,570	0.81	1,982	0.40	.....
17.....	3.40	6,970	1.35	2,765	0.47	1,590	0.42	1,540	0.87	2,054	0.65	.....
18.....	3.22	6,502	1.31	2,697	0.43	1,550	0.41	1,530	0.95	2,155	0.61	.....
19.....	3.09	6,177	1.20	2,520	0.41	1,530	0.42	1,540	1.04	2,280	0.65	.....
20.....	2.95	5,655	1.10	2,370	0.40	1,520	0.44	1,560	0.96	2,168	0.69	.....
21.....	3.18	6,400	1.02	2,250	0.36	1,484	0.49	1,610	0.88	2,066	0.35	.....
22.....	3.44	7,074	0.85	2,030	0.35	1,475	0.61	1,442	0.58	1,708	0.19	.....
23.....	3.46	7,126	0.70	1,850	0.50	1,620	0.80	1,970	0.61	1,742	0.37	.....
24.....	3.33	6,788	0.68	1,826	0.52	1,642	0.79	1,958	0.66	1,802	0.55	.....
25.....	3.34	6,814	0.68	1,826	0.50	1,620	0.78	1,946	0.57	1,697	0.81	.....
26.....	3.42	7,022	0.75	1,910	0.47	1,590	0.78	1,946	0.41	1,530	0.00	.....
27.....	3.48	7,178	0.70	1,850	0.42	1,540	0.80	1,970	0.23	1,367	0.25	.....
28.....	3.38	6,918	0.70	1,850	0.39	1,511	0.82	1,994	.....	②.....	0.69	.....
29.....	2.88	5,696	0.65	1,790	0.35	1,475	0.82	1,994	.....	.....	0.71	.....
30.....	2.67	5,250	0.63	1,766	0.30	1,430	0.84	2,018	.....	.....	0.65	.....
31.....	2.50	4,910	0.55	1,675	.....	.....	0.84	2,018	.....	.....	0.80	③.....

① Water below bottom of gauge.

② Not sufficient data to compute discharge.

## MONTHLY DISCHARGE of Belly River, near Lethbridge, for 1911-12.

(Drainage area 6,146 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Persquare Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911.						
September.....	22,050	2,125	8,788	1.43	1.60	522,894
October.....	4,350	1,912	2,536	.461	.53	174,376
November.....	2,500	1,712	2,135	.346	.28	93,158
December.....	1,912	1,412	1,672	.272	.10	33,163
The period.....					2.51	823,591
1912.						
January.....	990	930	964	0.156	0.18	59,274
February.....	987	753	896	0.145	0.16	51,539
March.....	6,554	708	1,806	0.292	0.34	110,715
April.....	4,890	2,250	8,610	0.584	0.65	214,810
May.....	12,970	3,602	7,886	1.28	1.48	484,557
June.....	14,810	6,375	7,883	1.28	1.43	468,908
July.....	8,110	4,910	6,792	1.10	1.27	417,512
August.....	5,010	1,675	2,953	0.480	0.55	181,408
September.....	1,898	1,430	1,625	0.263	0.29	96,430
October.....	2,018	1,322	1,636	0.265	0.31	100,257
November (1 to 27).....	2,280	1,367	1,856	0.300	0.30	99,396
The period.....					6.96	2,284,806

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Belly River drainage basin, in 1912.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. feet.	Ft. per Sec.	Sec.-ft.
April 29.....	L. J. Gleeson....	West Branch of Mami Creek....	S.E. 18-2-27-4	15	13.2	0.87	11.5
May 15....	do .....	do .....	do .....	15	12.7	0.75	9.56

NOTE.—Width is the actual width of water surface, not including piers. Area of section is the total area of the measured section including both moving and still water.

## ST. MARY RIVER DRAINAGE BASIN.

### General Description.

St. Mary River, an important tributary of the Belly River and so indirectly of the South Saskatchewan River, heads in northern Montana on the eastern slope of the main range of the Rocky Mountains. It starts from the great Blackfoot glacier and receives affluents from numerous lesser glaciers. These streams unite within a short distance from their sources and flow into Upper St. Mary Lake. Below this lake and in close proximity, is lower St. Mary Lake, the aggregate length of the two being about 22 miles. The river flows out of the lower lake, at an elevation of 4,460 feet above mean sea level, and takes a northerly course through the foothills to the international boundary. From the boundary it flows in a north and easterly direction, through a rolling country, finally emptying into the Belly River near Lethbridge, Alta.

The basin is bounded on the south by the Rocky Mountains, on the west by the watershed between Belly and St. Mary Rivers and on the east by the watershed between Milk and St. Mary Rivers. The upper portion of the basin is heavily timbered and receives its precipitation mostly in the shape of snowfall, but the lower and major portion is totally devoid of tree growth, and has a small precipitation.

The river flows through a very deep valley having steep banks, making the diversion of water from this stream for irrigation an expensive undertaking. In Canada, the Canadian Pacific Railway Company have water rights on this river. The headgates of their canal is at Kimball, 5 miles north of the boundary, and they already have 231 miles of ditch constructed, which irrigates land surrounding Lethbridge. Further construction is being planned and the works, when completed, will irrigate approximately 500,000 acres of, at present, semi-arid land.

As this is an international river, discharge measurements are taken on it by the Hydrographic Surveys branches of both the Canadian and American governments. It is expected that during 1913 the hydrographers of both countries will use a common gauging station at a point as near the international boundary as a suitable site can be found. It is hoped in this way to obtain results of a high degree of accuracy and perfectly satisfactory to both countries. To enable this to be done a concrete gauge house was constructed in the fall of 1912 and an automatic gauge is being installed.

### ST. MARY RIVER NEAR KIMBALL.

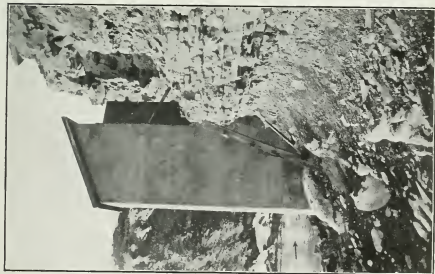
This station was established by the Alberta Railway and Irrigation Company, in 1905. It is located on the S. W.  $\frac{1}{4}$  Sec. 25, Tp. 1, Rge. 25, W. 4th Mer., about one half mile above the Canadian Pacific Railway Company's dam and headgate.

The gauge, which is a plain staff graduated to feet and hundredths, is set in the right bank, a few feet upstream from the cable. A trench, lined with plank, connects a stilling box about the gauge with the channel in low water. The zero of the gauge (elev. 86.87) is referred to a permanent iron bench mark (assumed elev. 100.00), situated near the cable support on the right bank. An auxiliary gauge, located on the S. W.  $\frac{1}{4}$  Sec. 25, Tp. 1, Rge. 25, W. 4th Mer., at the highway bridge, is used during the winter. The zero of this gauge (elev. 88.95) is referred to a permanent bench mark (assumed elev. 100.00) on the right abutment of the bridge.

The channel is straight for about 450 feet above and 400 feet below the station. Both banks are high and not liable to overflow. The right bank is partly covered with scrub above the station, but at and below the station it is clear. The bed of the stream is of gravel and is liable to slight changes. The current is quite uniform all the way across the stream.

Discharge measurements are made by means of a cable car, and tagged wire at high and ordinary stages. At low water periods, the river can be waded. The initial point for soundings is the zero of the tagged wire, which is 44.8 feet from the inside edge of a cable support on the right bank.

During 1911 and 1912, the gauge was read by J. M. Dunn, ditch rider for the Canadian Pacific Railway Company.



Concrete Shelter for Automatic Gauge  
on St. Mary River near Kimball, Alberta.  
Taken by V. Meek.



Concrete Shelter for Automatic Gauge  
on St. Mary River near Kimball, Alberta.  
Taken by V. Meek.



SESSIONAL PAPER No. 25d

## DISCHARGE MEASUREMENTS OF St. Mary River, near Kimball, in 1911-12.

Date.	Hydrographer.	Width.	Area. of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
Jan. 16	W. H. Greene	100.7	173.9	1.21	6.26	210.2
Feb. 3	do	66.0	100.3	2.02	5.53	202.4
Mar. 16	J. E. Degnan	68.0	82.1	1.73	4.95	141.6
Mar. 29	do	150.0	224.6	1.60	4.63	360.3
April 1	do	65.0	108.1	2.95	4.15	318.8
April 8	L. J. Gleeson	62.8	97.2	2.80	5.20	271.8
April 21	L. J. Gleeson	220.8	376.5	1.42	2.82	536.2
May 1	do	223.8	499.4	2.16	3.28	1,076.2
May 16	do	227.4	893.1	4.27	5.00	3,812.0
May 19	do	226.0	796.1	3.70	4.56	2,945.3
June 3	do	228.0	809.6	3.83	5.00	3,330.3
June 7	do	227.5	858.6	3.84	4.78	3,298.6
June 9	do	226.9	836.0	3.90	4.77	3,261.3
June 20	do	228.0	904.2	4.26	5.05	3,855.4
June 27	do	227.7	841.1	3.90	4.78	3,284.0
July 12	do	224.8	604.8	2.81	3.81	1,702.0
July 20	do	225.0	574.9	2.76	3.70	1,584.9
July 20	do	225.0	573.8	2.76	3.70	1,582.1
Aug. 3	do	222.5	513.7	2.28	3.41	1,170.9
Aug. 16	do	222.5	473.9	2.24	3.28	1,059.5
Aug. 16	do	222.0	473.9	2.28	3.28	1,082.8
Aug. 29	do	222.4	415.0	1.78	2.97	736.9
Sept. 7	do	225.0	598.4	2.74	3.77	1,639.7
Sept. 23	do	224.5	575.5	2.48	3.65	1,428.5
Oct. 7	do	221.6	436.1	1.72	3.07	753.1
Nov. 16	do	65.0	122.3	2.62	6.30	320.6
Dec. 12	D. D. McLeod	102.0	103.3	1.28	1.51	131.9
1912						
Jan. 4	D. D. McLeod	60.0	130.6	0.98	3.50	128.38
Jan. 21	do	52.0	120.1	1.73	3.00	208.05
Feb. 8	do	140.0	202.5	0.68	2.40	150.0
Feb. 21	do	140.0	171.2	0.77	2.58	131.0
Mar. 8	do	110.0	124.75	1.01	1.86	125.64
Mar. 22	do	102	100.18	1.30	2.30	130.60
April 15	L. J. Gleeson	98.5	163.3	3.46	.65	564.5
April 25	do	221.0	418.9	1.72	3.00	720.6
May 4	do	222.0	444.9	1.78	3.10	791.5
May 11	do	223.7	572.3	2.55	3.63	1,461.3
May 28	do	228.0	787.1	3.49	4.59	2,754.1
June 3	do	225.5	702.1	3.10	4.22	2,175.9
June 19	do	225.5	716.0	3.14	4.20	2,250.6
June 19	do	225.5	704.8	3.05	4.20	2,157.7
July 1	do	225.5	698.4	3.19	4.20	2,225.0
July 3	do	225.5	696.8	3.07	4.18	2,134.8
July 15	V. Meek	222.0	502.6	2.51	3.78	1,489.0
July 22	do	225.0	648.4	2.78	3.98	1,802.3
Aug. 6	do	224.0	524.8	2.23	3.50	1,169.0
Aug. 9	do	222.5	501.9	2.04	3.36	1,023.3
Aug. 23	do	220.0	426.7	1.62	3.04	693.4
Sept. 14	do	220.5	396.7	1.58	2.98	628.7
Oct. 6	do	219.0	308.5	1.46	2.56	523.0
Oct. 23	G. F. Deas	222.0	358.0	1.46	2.88	421.4
Nov. 1	V. Meek	218.0	343.0	1.23	2.75	421.4
Nov. 16	do	220.5	361.0	1.40	2.85	505.7
Nov. 20	do	220.5	339.6	1.11	2.79	376.4
Dec. 5	do	63.0	96.2	2.68	.10	255.8
Dec. 23	do	66.0	97.8	2.15	2.49	210.6



## DAILY GAUGE-HEIGHT AND DISCHARGE of St. Mary River, near Kimball, for 1911.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	6.43	220	5.85	206	5.45	194	4.15	319	3.29	1,074	4.27	2,388
2.....	6.43	219	5.84	206	5.40	188	4.20	322	3.29	1,074	4.87	3,480
3.....	6.40	218	5.53	202	5.40	188	4.53	287	3.32	1,108	5.01	3,793
4.....	6.35	216	5.55	204	5.35	183	4.57	289	3.39	1,188	5.10	4,000
5.....	6.15	213	5.54	203	5.33	181	4.58	289	3.57	1,407	4.98	3,725
6.....	6.35	215	5.65	214	5.30	178	5.05	265	3.87	1,794	4.88	3,502
7.....	6.36	214	5.65	214	5.21	169	5.04	265	3.97	1,933	4.77	3,270
8.....	6.10	210	5.47	196	5.12	159	5.20	272	3.97	1,933	4.79	3,310
9.....	5.60	203	5.35	183	5.14	161	5.00	263	3.92	1,863	4.77	3,270
10.....	4.95	194	5.35	183	4.90	136	2.55	296	3.90	1,835	4.77	3,270
11.....	④4.95	194	5.45	194	4.85	131	2.45	299	3.87	1,794	4.88	3,502
12.....	⑤5.62	203	5.40	188	4.85	131	2.30	250	3.80	1,700	5.09	3,977
13.....	6.30	213	5.35	183	4.90	136	2.30	250	3.87	1,794	5.19	4,207
14.....	6.30	213	5.27	175	4.90	136	2.32	260	3.99	1,961	5.27	4,391
15.....	6.31	213	5.25	173	4.87	133	2.35	275	4.42	2,629	5.27	4,391
16.....	6.26	212	5.23	171	4.95	142	2.40	300	5.03	3,839	5.24	4,322
17.....	6.25	212	5.20	167	4.85	131	2.50	360	4.96	3,680	5.19	4,207
18.....	6.30	213	5.23	171	4.95	145	2.53	382	4.80	3,330	5.17	4,161
19.....	6.35	213	5.30	178	5.06	158	2.55	398	4.57	2,891	5.10	4,000
20.....	6.35	213	5.35	183	5.25	181	2.65	472	4.39	2,579	5.04	3,862
21.....	6.30	213	5.35	183	5.20	181	2.82	607	4.30	2,435	4.97	3,702
22.....	6.25	212	5.38	185	5.25	189	2.95	722	4.28	2,404	4.90	3,545
23.....	6.12	210	5.38	185	5.20	186	3.10	870	4.27	2,388	4.92	3,590
24.....	6.15	210	5.40	188	5.20	186	3.14	912	4.25	2,358	4.97	3,702
25.....	6.10	210	5.41	189	5.00	165	3.18	954	4.14	2,187	5.17	4,161
26.....	6.00	208	⑤5.42	190	4.60	285	3.28	1,063	4.07	2,080	4.97	3,702
27.....	5.95	208	5.44	192	4.45	331	3.34	1,131	3.97	1,933	4.78	3,290
28.....	5.95	208	5.44	192	4.43	337	3.37	1,165	3.89	1,822	4.65	3,038
29.....	5.95	208	.....	.....	4.65	360	3.39	1,188	3.80	1,790	4.57	2,891
30.....	5.95	208	.....	.....	4.55	351	3.28	1,063	3.76	1,648	4.57	2,891
31.....	6.00	208	.....	.....	4.40	335	.....	.....	3.87	1,794	.....	.....

④ Interpolated.

From Jan. 1 to Apr. 17 ice conditions.

## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of St. Mary River, near Kimball, for 1911.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.47	2,714	3.46	1,272	2.91	684	3.25	1,030	2.52	375	6.01	308
2.....	4.37	2,547	3.42	1,234	2.95	722	3.21	986	2.56	405	5.89	303
3.....	4.28	2,404	3.41	1,212	2.99	760	3.21	986	2.56	405	5.79	299
4.....	4.24	2,342	3.36	1,154	3.39	1,188	3.18	954	2.56	405	5.85	301
5.....	4.22	2,311	3.36	1,154	4.07	2,080	3.15	922	2.53	382	5.61	291
6.....	4.18	2,249	3.36	1,154	3.88	1,808	3.11	880	2.51	368	5.42	282
7.....	4.17	2,234	3.44	1,248	3.77	1,661	3.07	840	2.51	368	5.57	289
8.....	4.12	2,156	3.38	1,177	3.75	1,635	2.99	760	4.48	351	5.59	290
9.....	4.07	2,080	3.58	1,420	3.65	1,508	2.96	734	4.51	335	5.56	288
10.....	3.97	1,933	3.56	1,395	3.61	1,458	2.96	734	4.48	319	①	236
11.....	3.87	1,794	3.41	1,212	3.64	1,495	2.93	704	4.59	303	①	184
12.....	3.81	1,714	3.41	1,212	3.68	1,545	2.96	734	5.52	286	1.50	132
13.....	3.76	1,648	3.41	1,212	3.71	1,583	2.94	713	6.21	317	1.55	140
14.....	3.71	1,583	3.34	1,131	3.74	1,622	3.00	770	6.35	324	1.55	140
15.....	3.74	1,622	3.27	1,052	3.65	1,508	2.96	734	6.32	323	1.55	140
16.....	3.76	1,648	3.28	1,063	3.65	1,508	2.91	684	6.30	322	1.60	149
17.....	3.84	1,754	3.26	1,041	3.58	1,420	2.86	641	6.13	314	1.60	149
18.....	3.80	1,700	3.20	975	3.56	1,395	2.83	616	5.56	288	1.60	149
19.....	3.74	1,622	3.21	986	3.51	1,332	2.81	598	6.11	313	1.60	149
20.....	3.68	1,545	3.21	986	3.45	1,260	2.79	582	6.06	311	1.70	167
21.....	3.66	1,520	3.26	1,041	3.46	1,272	.77	566	6.01	309	1.80	185
22.....	3.64	1,495	3.16	953	3.56	1,395	2.78	574	5.90	303	1.55	140
23.....	3.66	1,520	3.11	880	3.64	1,495	2.77	566	5.82	300	1.55	140
24.....	3.66	1,520	3.07	840	3.61	1,458	2.77	566	5.76	297	①2.38	134
25.....	3.56	1,395	3.04	810	3.58	1,420	2.71	518	5.77	298	3.20	129
26.....	3.56	1,395	3.05	820	3.48	1,296	2.61	442	5.72	295	3.30	128
27.....	3.56	1,395	3.06	830	3.46	1,272	2.64	465	6.23	318	3.30	128
28.....	3.53	1,358	3.01	780	3.49	1,308	2.61	442	7.26	365	3.45	128
29.....	3.47	1,284	2.97	744	3.36	1,154	2.54	390	7.16	360	3.70	128
30.....	3.56	1,395	2.96	734	3.29	1,074	2.56	405	7.16	360	3.45	128
31.....	3.56	1,395	2.91	684			2.57	412			①3.58	128

① Interpolated.

From Nov. 8 to Dec. 31, ice conditions.

## DAILY GAUGE-HEIGHT AND DISCHARGE of St. Mary River, near Kimball, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1..	3 70	128	2 35	174	2 30	130	2 00	169	3 05	700	4 30	2,340
2..	3 70	128	2 60	170	2 30	130	2 00	209	3 09	740	4 26	2,270
3..	3 70	128	2 61	167	①	130	1 90	248	3 11	760	4 22	2,290
4..	3 58	128	2 62	163	2 25	130	1 80	288	3 10	760	4 19	2,148
5..	3 50	134	2 70	160	2 15	131	1 60	327	3 11	760	4 13	2,050
6..	3 40	137	2 62	157	2 10	131	1 50	367	3 12	770	4 12	2,033
7..	3 40	142	2 55	154	2 10	131	①	406	3 13	780	4 05	1,925
8..	3 30	147	2 40	150	2 15	131	90	446	3 14	790	4 03	1,895
9..	3 30	151	2 47	148	2 18	131	60	485	3 40	1,060	4 15	2,082
10..	3 30	156	2 50	147	2 25	131	55	524	3 55	1,238	4 25	2,252
11..	3 25	160	2 40	146	2 30	130	65	564	3 63	1,339	4 30	2,340
12..	3 25	166	2 35	144	2 20	131	70	584	3 66	1,378	4 35	2,430
13..	3 25	170	2 40	143	2 10	131	70	584	3 66	1,378	4 50	2,710
14..	3 25	174	2 40	142	2 20	131	65	564	3 81	1,574	4 55	2,810
15....	3 25	179	2 35	140	2 30	130	2 75	425	3 97	1,805	4 50	2,710
16..	3 20	184	2 35	131	2 30	130	2 75	425	4 34	2,412	4 43	2,577
17..	3 15	189	2 35	137	2 00	131	2 77	439	4 35	2,430	4 33	2,394
18..	3 15	193	2 36	136	1	129	2 80	460	4 43	2,577	4 25	2,252
19..	3 10	198	2 40	134	1 65	130	2 85	505	4 45	2,615	4 20	2,165
20..	3 00	203	2 45	133	2 05	131	2 85	505	4 53	2,770	4 20	2,165
21..	①	208	2 48	132	2 05	131	2 87	523	4 80	3,330	4 19	2,148
22..	2 85	205	2 48	130	2 30	130	2 88	532	4 80	3,330	4 28	2,305
23..	2 85	202	2 55	130	2 35	130	2 89	541	4 65	3,010	4 31	2,358
24..	2 80	199	2 60	130	①	130	2 85	600	4 50	2,810	4 33	2,394
25..	2 79	197	2 55	130	2 90	129	3 00	650	4 53	2,770	4 35	2,430
26..	2 75	193	2 50	130	2 95	129	3 05	700	①	2,850	4 33	2,394
27..	2 60	190	1	130	2 95	129	3 05	700	4 61	2,930	4 31	2,358
28..	2 53	186	2 00	131	2 95	129	3 03	680	4 60	2,910	4 30	2,340
29..	2 50	183	1 60	132	2 60	130	3 03	680	4 63	2,970	4 22	2,300
30..	2 47	180			2 30	130	3 01	660	4 63	2,970	4 20	2,165
31	2 30	177				131			4 35	2,430		

Jan. 1 to April 14 used gauge on S.W. 1-2-25-4.

① Interpolated.

## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of St. Mary River near, Kimball, for 1912.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	4 20	2,165	3 55	1,238	2 93	580	2 57	328	2 90	550	5 42	382
2.	4 22	2,200	3 55	1,238	2 93	580	2 57	328	2 90	550	6 12	350
3.	4 19	2,148	3 50	1,175	2 94	590	2 57	328	2 88	532	6 12	319
4.	4 10	2,000	3 57	1,262	2 93	580	2 55	320	2 88	532	①	287
5.	4 10	2,000	3 52	1,200	2 94	590	2 55	320	2 86	514	.10	256
6.	4 00	1,850	3 50	1,175	2 92	570	2 56	324	2 86	514	.10	256
7.	3 90	1,700	3 51	1,188	2 89	541	2 58	332	2 85	505	.14	255
8.	3 85	1,630	3 36	1,018	2 92	570	2 58	332	2 84	496	.19	254
9.	3 85	1,630	3 35	1,008	2 94	590	2 62	350	2 84	496	①	254
10.	3 80	1,560	3 31	966	2 92	570	2 62	350	2 84	496	①	255
11.	3 80	1,560	3 28	934	2 97	620	2 68	380	2 85	505	.14	255
12.	3 80	1,560	3 28	934	2 97	620	2 71	397	2 86	514	.09	256
13.	3 75	1,495	3 24	892	2 97	620	2 73	411	①	505	.09	256
14.	3 78	1,534	3 21	860	2 97	620	2 76	432	2 84	496	.12	256
15.	3 72	1,456	3 21	860	2 97	620	2 78	446	2 84	496	.14	255
16.	3 70	1,430	3 24	892	2 97	620	2 78	446	2 82	478	.20	254
17.	3 65	1,365	3 21	860	2 97	620	①	446	2 87	523	.21	254
18.	3 60	1,300	3 16	810	2 94	590	①	446	2 85	504	①	254
19.	3 55	1,238	3 11	769 <sup>h</sup>	2 92	570	2 78	446	2 80	460	.22	254
20.	3 63	1,330	3 06	710	2 90	550	2 80	460	2 78	446	.24	253
21.	3 92	1,730	3 06	710	2 87	523	2 81	469	2 78	446	.34	251
22.	3 97	1,805	3 06	710	2 82	478	2 82	478	2 75	425	①	231
23.	4 00	1,850	3 04	690	2 82	478	2 82	478	2 82	478	2 49	211
24.	4 00	1,850	3 04	690	2 87	523	2 83	487	2 82	478	2 39	206
25.	4 00	1,850	3 02	670	2 85	505	2 84	496	2 82	570	2 39	202
26.	3 92	1,730	3 04	690	2 82	478	2 84	496	3 12	539	2 49	196
27.	3 80	1,560	3 02	670	2 82	478	2 84	496	3 42	507	2 64	192
28.	3 73	1,469	3 01	660	2 72	404	2 86	514	3 42	475	2 64	186
29.	3 65	1,365	2 99	640	2 67	375	2 87	523	①	444	2 64	182
30.	3 60	1,300	2 97	620	2 65	365	2 88	532	3 62	413	2 64	177
31.	3 60	1,300	..	600	..	..	..	532	..	..	2 64	174

Dec. 5 to 31 used gauge at S.W. 1-2-25-4.

① Interpolated.

## MONTHLY DISCHARGE of St. Mary River, near Kimball, for 1911-12.

(Drainage area 472 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911.						
January.....	220	194	207	0.44	0.507	12,937
February.....	214	167	190	0.40	0.417	10,508
March.....	360	131	246	0.41	0.473	12,034
April.....	1,188	250	719	1.12	1.250	31,376
May.....	3,839	1,074	2,456	4.38	5.050	127,249
June.....	4,391	2,388	3,390	7.74	8.636	217,209
July.....	2,714	1,284	1,999	3.77	4.346	109,630
August.....	1,420	684	1,052	2.21	2.548	64,217
September.....	2,080	684	1,382	2.92	3.258	81,949
October.....	1,030	390	710	1.43	1.649	41,547
November.....	405	286	346	0.70	0.781	19,874
December.....	308	128	218	0.40	0.461	11,664
The year.....					29.376	740,254
1912.						
January.....	208	128	171	0.362	0.42	10,514
February.....	174	130	138	0.292	0.31	7,938
March.....	131	129	130	0.275	0.32	7,993
April.....	700	169	493	1.04	1.16	29,336
May.....	3,330	700	1,966	4.16	4.80	120,886
June.....	2,810	1,895	2,295	4.86	5.42	136,560
July.....	2,230	1,238	1,644	3.48	4.01	101,084
August.....	1,262	600	882	1.87	2.16	54,232
September.....	620	365	547	1.16	1.29	32,549
October.....	532	320	423	0.896	1.03	26,009
November.....	570	413	496	1.05	1.17	29,514
December.....	382	174	246	0.521	0.60	15,126
The year.....					22.69	571,741

## CANADIAN PACIFIC RAILWAY COMPANY IRRIGATION CANAL NEAR KIMBALL.

This station was established July 26, 1910, by F. H. Peters. It is located at the flume over Rolph Creek on the S. E.  $\frac{1}{4}$  Sec. 21, Tp. 2, Rge. 24, W. 4th Mer. It is by trail fifteen miles southeast of Cardston, and six miles northeast of Kimball.

The gauge, which is a plain staff graduated to feet and hundredths, is fastened to the side of the flume five feet downstream from the foot-bridge. The datum of the gauge is the bottom of the flume.

The flume carries all the water delivered to the company's irrigation system. It is 768 feet long, 27 feet wide, and 6 feet high (inside dimensions) and is perfectly straight. It is built of smooth plank and has a fall of one hundredth of a foot in sixteen feet.

Discharge measurements are made from a small footbridge spanning the flume at a point about midway from the ends. The initial point for soundings is the inside face of the left side of the flume.

During 1911 and 1912, the gauge was read by J. M. Dunn, ditch rider for the Company.

## SESSIONAL PAPER No. 25d

## DISCHARGE MEASUREMENTS of Canadian Pacific Railway Company Irrigation Canal, near Kimball, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.						
April 29.....	L. J. Gleeson	27.2	56.95	4.32	2.00	246.30
May 17.....	do	27.2	65.00	5.18	2.35	337.00
June 2.....	do	27.2	77.58	5.81	2.75	450.81
June 21.....	do	27.2	95.77	6.05	3.33	578.95
July 13.....	do	27.2	80.10	5.78	2.95	462.70
July 21.....	do	27.2	81.40	5.86	3.00	472.67
July 21.....	do	27.2	81.40	6.07	3.00	495.02
Aug. 5.....	do	27.2	84.70	5.89	3.11	499.61
Aug. 17.....	do	27.2	73.50	5.27	2.63	387.00
Aug. 30.....	do	27.2	62.10	4.76	2.25	296.70
Oct. 10.....	do	27.2	78.66	5.78	2.87	417.19
Oct. 14.....	do	27.2	60.81	4.49	2.24	272.03
Oct. 15.....	do	27.2	38.80	3.23	1.43	125.43
Oct. 16.....	do	27.2	29.80	2.28	1.10	67.81
Oct. 16.....	do	27.2	29.80	2.42	1.10	72.29
Oct. 17.....	do	27.2	14.90	1.36	0.55	18.20
1912						
May 6.....	L. J. Gleeson	27.2	49.6	3.82	1.76	188.7
May 29.....	do	27.2	74.1	5.19	2.66	384.1
June 4.....	do	27.2	82.3	5.59	2.96	460.0
June 18.....	do	27.2	86.4	5.67	3.11	499.7
June 24.....	do	27.2	87.7	5.98	3.19	524.9
July 4.....	do	27.2	84.7	5.79	3.05	490.6
July 17.....	V. Meek	27.2	58.9	4.35	2.10	256.1
July 24.....	do	27.2	59.4	4.46	2.12	264.8
Aug. 10.....	do	27.2	64.9	4.74	2.32	308.8
Aug. 24.....	do	27.2	64.9	4.93	2.32	319.8
Aug. 31.....	do	27.2	64.9	4.73	2.32	307.9
Sept. 17.....	do	27.2	65.7	4.79	2.35	314.3
Oct. 1.....	do	27.2	32.9	4.13	1.88	218.2
Oct. 2.....	G. F. Deas	27.2	30.3	2.87	1.08	87.05

## DAILY GAUGE-HEIGHT AND DISCHARGE of Canadian Pacific Railway Company Irrigation Canal near Kimball, for 1911.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			0.66	25	2.43	333		
2.....			0.66	25	2.75	410		
3.....			1.08	67	2.75	410		
4.....			2.08	254	2.90	447		
5.....			2.17	273	2.82①	427		
6.....			2.25	292	2.75	410		
7.....			2.08	254	2.75①	410	3.35	⑤560
8.....			2.08	254	2.75	410	3.35	560
9.....			2.08	254	2.84①	432	2.20①	280
10.....			2.08	254	2.93	454	2.05	248
11.....			2.08	254	2.96①	462	2.80	422
12.....			2.08	254	3.00	472	2.90	447
13.....			2.08	254	2.92①	452	2.95	460
14.....			2.08	254	2.85	434	3.00	472
15.....			2.17	273	2.92①	452	3.10	497
16.....			2.26①	294	3.00	472	3.11①	500
17.....			2.35	314	3.00①	472	3.12	502
18.....			2.35	314	3.00	472	3.11①	500
19.....			2.35	314	3.00	472	3.10	497
20.....			2.39①	324	2.16①	271	3.05①	484
21.....			2.43	333	3.33	555	3.00	472
22.....			2.40①	326	3.43	581	3.00	472
23.....			2.37①	319	3.43	581	2.98①	467
24.....			2.35	314	2.43	581	2.95	460
25.....	1.50	①138	2.35①	314	2.43	581	3.00	472
26.....	1.50	138	2.35①	314	⑤		3.02①	477
27.....	2.00	237	2.35	314			3.05	484
28.....	2.00	237	2.37①	319			3.02①	477
29.....	2.00	237	2.40①	326			3.00	472
30.....	2.00	237	2.43	333			3.05①	484
31.....			2.43	333			3.10	497

① Gauge height interpolated.

② Headgates opened.

③ Headgates closed.

DAILY GAUGE-HEIGHT AND DISCHARGE of Canadian Pacific Railway Canal, near Kimball, for 1912.—*Concluded.*

DAY.	August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3 10	497	①2 49	348	①3.05	484
2.....	3.05	484	2 60	374	①3.05	484
3.....	3.05	484	①2 42	331	3.05	484
4.....	3 12	502	①2 24	289	①3.05	484
5.....	3 12	502	2 05	248	①3.05	484
6.....	①2 59	444	①.....	.....	①3.05	484
7.....	2 65	386	.....	.....	3 05	484
8.....	①2 65	386	.....	.....	①3.05	484
9.....	2 65	386	.....	.....	3 05	484
10.....	2 65	386	.....	.....	2 85	434
11.....	①2 62	379	①1 05	63	①2 85	434
12.....	2 60	374	①1 36	111	2 85	434
13.....	①2 60	374	①1 67	170	①2 54	360
14.....	①2 60	374	①1 98	233	2 24	287
15.....	2 60	374	2 30	303	1 43	125
16.....	①2 62	379	2 30	303	1 10	69
17.....	2 63	381	①2 42	331	0 55	18
18.....	2 63	381	2 55	362	①0 62	22
19.....	2 63	381	①2 57	367	0 70	28
20.....	①2 63	381	①2 60	374	0 70	28
21.....	2 63	381	①2 62	379	①.....	.....
22.....	①2 63	381	2 65	386	.....	.....
23.....	①2 63	381	2 65	386	.....	.....
24.....	2 63	381	①2 62	379	.....	.....
25.....	①2 55	362	2 60	374	.....	.....
26.....	①2 47	343	①2 60	374	.....	.....
27.....	①2 39	324	①2 60	374	.....	.....
28.....	2 30	303	2 60	374	.....	.....
29.....	①2 28	298	3 05	484	.....	.....
30.....	2 25	292	3 05	484	.....	.....
31.....	①2 37	319	.....	.....	.....	.....

① Gauge height interpolated.

② Headgates opened.

③ Headgates closed.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Canadian Pacific Railway Company Irrigation Canal near Kimball, for 1912.

DAY.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1 25	92	3 00	472	3 18	517	2 10	258	2 31	305	1 88	212
2	1 65	166	3 00	472	3 12	502	2 10	258	2 32	308	1 08	67
3	1 75	186	2 98	467	3 12	502	2 10	258	2 32	308		①
4	1 80	196	2 96	462	3 05	484	2 10	258	2 32	308		
5	1 80	196	2 96	462	3 05	484	2 12	262	2 32	308		
6	1 76	188	2 96	462	3 05	484	2 12	262	2 32	308		
7	1 77	190	2 96	462	3 07	490	2 32	308	2 32	308		
8	1 77	190	2 96	462	3 03	480	2 32	308	2 35	314		
9	1 75	186	2 97	464	3 00	472	2 32	308	2 35	314		
10	1 75	186	3 00	472	2 60	374	2 32	308	2 35	314		
11	1 77	190	3 18	512	2 20	280	2 30	303	2 35	314		
12	1 77	190	3 18	517	2 10	258	2 32	308	2 35	314		
13	1 80	196	3 18	517	2 10	258	2 32	308	2 35	314		
14	1 78	192	3 18	517	2 10	258	2 32	308	2 35	314		
15	1 80	196	3 18	517	2 05	248	2 31	305	2 35	314		
16	2 30	303	3 17	514	2 10	258	2 31	305	2 35	314		
17	2 30	303	3 15	510	2 10	258	2 32	308	2 35	314		
18	2 30	303	3 12	502	2 10	258	2 32	308	2 35	314		
19	2 30	303	3 20	522	2 10	258	2 32	308	2 35	314		
20	2 30	303	3 20	522	2 10	258	2 32	308	2 35	314		
21	2 30	303	3 19	520	2 11	260	2 31	305	2 35	314		
22	2 30	303	3 19	520	2 12	262	2 33	310	2 34	312		
23	2 26	294	3 17	514	2 11	260	2 34	312	2 31	305		
24	2 28	298	3 20	522	2 10	258	2 32	308	2 32	308		
25	2 29	301	3 20	522	2 10	258	2 32	308	2 33	310		
26	2 50	350	3 20	522	2 10	258	2 32	308	2 31	305		
27	2 49	348	3 20	522	2 08	254	2 32	308	2 30	303		
28	2 49	348	3 20	522	2 06	250	2 32	308	2 28	298		
29	2 66	388	3 20	522	2 10	258	2 32	308	2 25	292		
30	2 75	410	3 19	520	2 10	258	2 32	308	2 25	292		
31	2 92	452			2 10	258	2 31	305				

① Headgates closed.

## MONTHLY DISCHARGE of Canadian Pacific Railway Canal, near Kimball, for 1911-12.

(Drainage area — square miles)

MONTH.	DISCHARGE IN SECOND-FOOT.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
April (25-30) ..	237	138	204			2,428
May .....	333	25	269			16,540
June .....	581	271	382			22,731
July .....	560	248	376			23,119
August .....	502	292	387			23,796
September .....	484	63	273			16,245
October (1-20) ..	484	18	330			13,091
The period ....						117,950
1912.						
May .....	452	92	260			15,987
June .....	522	462	500			29,752
July .....	517	248	330			20,291
August .....	312	258	298			18,323
September .....	314	292	309			18,387
October (1 and 2) ..	212	67	140			555
The period .....						103,295



## ROLPH CREEK NEAR KIMBALL.

This station was established on May 17, 1911, by L. J. Gleeson. It is located at the Canadian Pacific Railway Company's flume, in S. E.  $\frac{1}{4}$  Sec. 21, Tp. 2, Rge. 24, W. 4th Mer. It is  $\frac{1}{2}$  miles northeast of Kimball and fifteen miles southeast of Cardston.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the downstream side of the right hand wing wall. The zero (elev. 93.461) is referred to a bench mark on the sill of a trestle (assumed elev. 100.00) ten feet from the gauge.

The channel is straight for about 200 feet above the station and for 150 feet below. The bed is gravelly in character and shifts during high water. Both banks are low, bare, and overflow at high stages. While passing under the flume the water is carried over an apron built to protect the piling from scour.

Discharge measurements are made by wading at or near the gauge.

During 1911 and 1912, the gauge was read by J. M. Dunn.

## DISCHARGE MEASUREMENTS of Rolph Creek, near Kimball, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
April 29.....	L. J. Gleeson .....	12.9	10.68	1.14	.....	12.1
May 17.....	do .....	24.0	21.00	2.77	2.64	58.3
May 17.....	do .....	24.0	21.00	2.99	2.64	62.9
May 17.....	do .....	24.0	21.00	3.20	2.64	65.7
June 2.....	do .....	12.1	9.22	1.44	2.05	13.3
June 21.....	do .....	9.1	4.46	2.84	1.75	12.7
June 29.....	do .....	12.3	11.20	1.67	1.65	18.7
July 13.....	do .....	10.8	3.06	0.71	1.15	2.18
July 21.....	do .....	9.0	1.71	0.59	1.11	1.01
Aug. 5.....	do .....	9.5	4.30	0.42	1.22	1.80
Aug. 11.....	do .....	11.5	4.28	0.89	1.31	3.72
Aug. 30.....	do .....	7.0	1.40	0.79	1.10	1.11
Oct. 10.....	do .....	12.1	5.94	1.20	1.45	7.26
Oct. 17.....	do .....	12.2	5.28	1.34	1.37	6.97
1912.						
April 19.....	L. J. Gleeson .....	14.5	7.06	1.51	1.00	10.7
May 29.....	do .....	14.2	6.25	1.60	0.98	9.94
June 4.....	do .....	12.8	4.44	1.00	0.80	4.78
June 18.....	do .....	4.5	0.77	0.40	0.49	0.307
June 24.....	do .....	.....	.....	.....	0.48	①.....
July 4.....	do .....	1.9	0.45	0.28	0.42	0.125
July 17.....	V. Meek .....	11.8	5.60	1.10	0.84	6.16
July 24.....	do .....	12.8	6.63	1.05	0.94	6.95
Aug. 10.....	do .....	8.3	2.58	0.46	0.62	1.19
Aug. 24.....	do .....	1.0	0.10	0.60	0.50	0.06
Aug. 31.....	do .....	.....	.....	.....	0.44	①.....
Sept. 17.....	do .....	.....	.....	.....	0.55	①.....
Oct. 1.....	do .....	10.0	3.60	0.57	0.78	2.04
Nov. 21.....	do .....	11.6	6.22	0.75	1.25	4.66

① Slight flow.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Rolph Creek, near Kimball, for 1911.

DAY.	May.		June.		July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.10	28	1.50①	7.1	1.15	1.50
2.....			2.05	25	1.40①	5.0	1.15	1.50
3.....			2.03	24	1.30①	3.3	1.14	1.42
4.....			2.00	23	1.20①	2.0	1.18	1.80
5.....			1.98①	22	1.20	2.0	1.22	2.2
6.....			1.95	20	1.20①	2.0	1.25⑦	2.6
7.....			1.94①	20	1.20	2.0	1.27	2.9
8.....			1.93	19.7	1.20	2.0	1.30⑦	3.3
9.....			1.92①	19.3	1.20①	2.0	1.36	4.3
10.....			1.90	18.5	1.20	2.0	1.36	4.3
11.....			1.88①	17.8	1.20	2.0	1.35①	4.1
12.....			1.85	16.7	1.17	1.70	1.35	4.1
13.....			1.85①	16.7	1.15	1.50	1.33①	3.8
14.....			1.85	16.7	1.15	1.50	1.32①	3.6
15.....			1.85①	16.7	1.14	1.42	1.30	3.3
16.....	①		1.85	16.7	1.13①	1.34	1.30①	3.3
17.....	2.75	66	1.80③	15.1	1.12	1.26	1.31	3.5
18.....	2.70	63	1.78	14.5	1.13①	1.34	1.29	3.2
19.....	2.47	49	1.75	13.6	1.15	1.50	1.27	2.9
20.....	2.35①	42	1.75①	13.6	1.13①	1.34	1.25①	2.6
21.....	2.25	36	1.75	13.6	1.11	1.18	1.22	2.2
22.....	2.20①	33	1.75	13.6	1.20	2.00	1.20①	2.0
23.....	2.10①	28	1.80	15.1	1.18⑦	1.80	1.10①	1.10
24.....	2.00	23	2.50⑦	51	1.15	1.50	1.15	1.50
25.....	2.10①	28	3.60	117	1.14	1.42	1.15③	1.50
26.....	2.20①	33	2.50③	51	1.13③	1.34	1.14⑦	1.42
27.....	2.35	42	1.80	15.1	1.12	1.26	1.14①	1.42
28.....	2.30⑦	39	1.75	13.6	1.10①	1.10	1.14	1.42
29.....	2.25①	36	1.65	10.8	1.08	0.98	1.12⑦	1.26
30.....	2.20	33	1.60①	9.6	1.10①	1.10	1.10	1.10
31.....	2.15	30			1.15	1.50	1.10①	1.10

①No observations previous to May 17.

②Gauge height interpolated.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Rolph Creek, near Kimball, for 1911.

DAY.	September.		October.		November.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1...	①1.09	1 04	①1.42	5.4	1 35	4.1
2...	1.08	0 98	①1.43	5 6	①1.35	4 1
3...	①1.20	2 00	1 45	6.0	①1.34	3.9
4...	①1.30	3 3	①1.45	6.0	1 33	3.8
5...	①1.40	5.0	①1.44	5.8	①1.32	3.6
6...	①1.50	7 1	①1.43	5 6	1 30	3.3
7...	①1.60	9 6	1 43	5 6	①1.30	3.3
8...	①1.70	12 2	①1.44	5 8	1 30	3.3
9...	①1.80	15.1	1 45	6.0	①1.28	3.0
10...	①1.90	18 5	1 45	6.0	1 25	2.6
11...	2 00	23 0	①1.43	5 6	①1.25	2.6
12...	①1.90	18 5	1 42	5 4	①1.25	2 6
13...	①1.80	15 1	①1.41	5 2	1 25	2.6
14...	①1.60	9 6	1 40	5 0	①1.20	2.0
15...	1 54	8.1	1 39	4.8	1 15	1.50
16...	1.53	7 8	1.39	4 8	①1.15	1.50
17...	①1.54	8 1	1.37	4 5	1 15	1.50
18...	1.55	8 3	①1.36	4 3	1 15	1.50
19...	①1.52	7 6	1 36	4 3	①1.16	1.60
20...	①1.50	7.1	1 36	4 3	①1.18	1.80
21...	①1.48	6.7	①1.36	4 3	1 20	2.0
22...	1 45	6 0	①1.36	4 3	①1.22	2.2
23...	1 40	5 0	1 36	4 3	1 25	2.6
24...	①1.40	5.0	①1.33	3.8	1 28	3.0
25...	1 40	5.0	1 30	3 3	1 30	3.3
26...	①1.40	5.0	①1 30	3 3	.....	.....
27...	①1 39	4 8	①1 30	3 3	.....	.....
28...	1 38	4 6	1 30	3 3	.....	.....
29...	1 40	5 0	①1.31	3 5	.....	.....
30...	1 40	5 0	①1.32	3 6	.....	.....
31...	.....	.....	①1 33	3 8	.....	.....

① Gauge height interpolated.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Rolph Creek, near Kimball, for 1912.

DAY.	May.		June.		July.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.05	12.7	0.95	8.7	0.50	0.50
2.....	1.03	11.7	①0.90	7.1	0.55	0.90
3.....	1.03	11.7	①0.85	5.7	0.55	0.90
4.....	1.02	11.3	0.80	4.5	0.42	0.08
5.....	1.02	11.3	0.76	3.7	0.42	0.08
6.....	1.02	11.3	0.75	3.5	0.40	0.00
7.....	1.01	10.9	0.73	3.2	0.85	5.7
8.....	1.01	10.9	0.70	2.7	0.80	4.5
9.....	1.01	10.9	①0.67	2.3	0.80	4.5
10.....	1.00	10.5	0.65	2.0	0.90	7.1
11.....	1.00	10.5	0.65	2.0	0.95	8.7
12.....	0.99	10.1	0.65	2.0	0.95	8.7
13.....	0.98	9.8	0.65	2.0	0.93	8.0
14.....	0.96	9.1	0.65	2.0	0.85	5.7
15.....	0.94	8.4	0.63	1.76	0.83	5.2
16.....	0.90	7.1	0.60	1.40	0.85	5.7
17.....	0.88	6.5	0.55	0.90	0.85	5.7
18.....	0.88	6.5	0.55	0.90	0.85	5.7
19.....	0.88	6.5	0.50	0.50	0.85	5.7
20.....	0.88	6.5	0.45	0.20	0.87	6.3
21.....	0.90	7.1	0.45	0.20	0.90	7.1
22.....	1.05	12.7	0.45	0.20	0.95	8.7
23.....	1.15	17.3	0.50	0.50	0.95	8.7
24.....	1.15	17.3	0.50	0.50	0.96	9.1
25.....	1.12	15.8	0.45	0.20	1.00	10.5
26.....	1.10	14.9	0.47	0.32	1.00	10.5
27.....	1.08	14.0	0.47	0.32	0.98	9.8
28.....	1.06	13.1	0.48	0.38	0.95	8.7
29.....	1.08	14.0	0.49	0.44	0.90	7.1
30.....	1.06	13.1	0.49	0.44	0.87	6.3
31.....	1.02	11.3			0.85	5.7

① Gauge height interpolated.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Rolph Creek, near Kimball, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.83	5.2	0.44	0.16	0.74	3.3	0.80	4.5
2.....	0.83	5.2	0.44	0.16	0.74	3.3	0.80	4.5
3.....	0.80	4.5	0.44	0.16	0.75	3.5	0.79 <sup>①</sup>	4.3
4.....	0.78	4.1	0.44	0.16	0.75	3.5	0.78	4.3
5.....	0.77	3.9	0.45	0.20	0.75	3.5	0.79	4.1
6.....	0.75	3.5	0.44	0.16	0.75	3.5	0.76	3.7
7.....	0.70	2.7	0.44	0.16	0.76	3.7	0.75	3.5
8.....	0.68	2.4	0.50	0.50	0.77	3.9	0.75	3.5
9.....	0.65	2.0	0.50	0.50	0.77	3.9	0.75	3.5
10.....	0.62	1.64	0.50	0.50	0.78	4.1	0.76 <sup>①</sup>	3.7
11.....	0.60	1.40	0.50	0.50	0.78	4.1	0.77 <sup>①</sup>	3.9
12.....	0.58	1.20	0.52	0.66	0.79	4.3	0.78	4.1
13.....	0.56	1.00	0.53	0.74	0.79	4.3	0.79	4.3
14.....	0.53	0.74	0.53	0.74	0.78	4.1	0.80	4.5
15.....	0.53	0.74	0.54	0.82	0.80	4.5	0.82	5.0
16.....	0.63	1.76	0.55	0.90	0.80	4.5	.....	.....
17.....	0.60	1.40	0.55	0.90	0.78 <sup>①</sup>	4.1	.....	.....
18.....	0.55	0.90	0.55	0.90	0.71 <sup>①</sup>	3.9	.....	.....
19.....	0.53	0.74	0.60	1.40	0.76	3.7	.....	.....
20.....	0.58	0.74	0.65	2.0	0.74	3.3	.....	.....
21.....	0.51	0.58	0.65 <sup>①</sup>	2.0	0.76	3.7	.....	.....
22.....	0.50	0.50	0.65	2.0	0.76	3.7	.....	.....
23.....	0.50	0.50	0.65	2.0	0.76	3.7	.....	.....
24.....	0.50	0.50	0.70	2.7	0.76	3.7	.....	.....
25.....	0.49	0.44	0.70	2.7	0.78	4.1	.....	.....
26.....	0.48	0.38	0.70 <sup>①</sup>	2.7	0.78	4.1	.....	.....
27.....	0.47	0.32	0.70	2.7	0.78	4.1	.....	.....
28.....	0.47	0.32	0.70	2.7	0.79 <sup>①</sup>	4.3	.....	.....
29.....	0.46	0.26	0.72	3.0	0.79	4.3	.....	.....
30.....	0.45 <sup>①</sup>	0.20	0.73 <sup>①</sup>	3.2	0.80	4.5	.....	.....
31.....	0.44	0.16	.....	.....	0.80	4.5	.....	.....

① Gauge height interpolated.

## MONTHLY DISCHARGE of Rolph Creek, near Kimball, for 1911-12.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911.						
May (17-31).....	66.	23	38.7	0.523	0.29	1,151
June.....	117.	9.6	22.9	0.310	0.35	1,363
July.....	7.1	0.98	1.92	0.026	0.03	118
August.....	4.3	1.10	2.46	0.033	0.04	151
September.....	23.	0.98	8.00	0.108	0.12	476
October.....	6.0	3.3	4.74	0.064	0.07	291
November (1-25).....	4.1	1.50	2.69	0.036	0.03	133
The period.....					0.93	3,683
1912.						
May.....	17.3	6.5	11.1	0.150	0.17	682
June.....	8.7	0.20	1.99	0.027	0.03	118
July.....	10.5	0.00	5.96	0.081	0.09	366
August.....	5.2	0.16	1.61	0.022	0.02	99
September.....	3.2	0.16	1.26	0.017	0.02	75
October.....	4.5	3.3	3.92	0.053	0.06	241
November (1-to 15).....	5.0	3.5	4.09	0.055	0.03	121
The period.....					0.42	1,702

## SESSIONAL PAPER No. 25d

## LEE CREEK AT CARDSTON.

This station was established on June 28, 1909, by H. C. Ritchie. It is located at a footbridge in the eastern portion of the town of Cardston on the N. W.  $\frac{1}{4}$  Sec 10, Tp. 3, Rge. 25, W. 4th Mee.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a pile near the east end of the footbridge. The zero (elev. 91.60) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the right bank 100 feet upstream from the gauge.

The channel is straight for 100 feet above and 300 feet below the station. The bed of the stream is composed of gravel with a thin covering of soft mud. In high water the current is very swift, but in low water it is comparatively slow. The right bank is of clay formation, high and not liable to overflow. The left is low, gravelly and overflows during high water.

On account of the constantly shifting character of the bed during periods of high water, measurements are made at the most suitable sections near the gauge. When the water is low, a section 150 feet upstream from the footbridge is used. The initial point of soundings is on the left bank and is marked with a stake driven into the left bank, close to the water's edge.

During 1911 and 1912, the gauge was read by Ora S. Williams.

## DISCHARGE MEASUREMENTS of Lee Creek at Cardston, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
April 4.	J. E. Degnan	28.0	35.5	0.76	1.67	27.0
April 8.	L. J. Gleeson	39.8	48.5	2.51	1.76	121.7
April 22.	do	58.1	69.4	2.99	2.47	207.5
April 28.	do	65.7	69.6	2.08	1.98	144.6
May 22.	do	102.2	113.6	2.52	2.08	286.5
May 31.	do	97.5	118.0	2.63	2.16	310.2
June 10.	do	94.4	94.9	2.09	1.98	199.0
June 12.	do	92.0	93.4	1.99	1.96	185.8
June 17.	do	47.2	55.9	2.75	1.84	153.7
July 3.	do	49.1	58.6	2.79	1.83	163.5
July 10.	do	45.0	43.1	2.05	1.40	88.4
July 24.	do	43.8	41.2	2.11	1.30	86.8
Aug. 1.	do	42.8	40.0	1.82	1.30	72.6
Aug. 19.	do	44.6	44.8	1.97	1.35	88.2
Aug. 27.	do	49.8	56.2	3.00	1.60	70.0
Sept. 8.	do	78.0	188.0	2.13	2.30	400.0
Sept. 20.	do	92.9	80.2	2.01	1.77	161.7
Oct. 13.	do	50.0	53.2	1.60	1.55	85.0
Nov. 4.	do	42.5	44.6	1.27	1.41	56.9
Nov. 14.	do	30.0	26.8	1.64	1.90	44.0
Dec. 13.	D. D. McLeod	33.0	32.9	1.00	1.86	32.9
1912.						
Jan. 3.	D. D. McLeod	30.0	18.5	1.14	1.90	21.12
Jan. 20.	do	27.0	23.2	1.25	2.66	29.0
Feb. 9.	do	30.0	25.4	0.83	2.48	21.0
Feb. 17.	do	35.0	18.8	0.79	2.51	14.86
Mar. 7.	do	30.0	24.5	0.42	2.31	10.2
Mar. 22.	do	25.0	20.0	0.83	2.64	16.7
April 15.	L. J. Gleeson	89.0	64.6	1.78	1.60	115.00
April 26.	do	82.0	64.9	1.74	1.55	111.0
May 14.	do	65.0	52.2	2.00	1.55	104.0
May 27.	do	69.0	67.6	2.19	1.70	148.2
June 6.	do	49.0	43.6	2.01	1.43	87.9
June 6.	do	49.0	43.6	2.01	1.43	88.7
June 17.	do	32.7	40.9	1.61	1.35	65.8
June 26.	do	31.3	32.2	1.10	1.15	35.5
July 5.	do	31.0	36.0	1.36	1.27	49.1
July 15.	do	30.3	33.0	2.10	1.38	69.3
July 26.	do	29.5	31.3	2.10	1.35	65.86
Aug. 5.	V. Meek	29.0	30.8	1.56	1.25	48.2
Aug. 12.	do	27.0	23.5	1.25	1.11	29.5
Aug. 12.	do	27.0	23.5	1.25	1.11	30.3
Aug. 22.	do	26.5	18.3	0.96	0.95	17.83
Sept. 2.	do	22.0	14.0	1.21	0.93	17.00
Sept. 12.	do	20.5	12.2	1.03	0.81	12.59
Oct. 9.	G. F. Deas	25.5	18.3	1.59	1.05	29.19
Oct. 19.	do	26.0	19.6	1.49	1.06	29.2
Nov. 2.	do	26.5	20.0	1.45	1.12	29.19
Nov. 12.	do	26.0	20.0	1.58	1.10	31.45
Nov. 22.	V. Meek	25.5	19.9	1.77	1.16	35.3
Nov. 28.	do	26.5	25.7	0.84	1.15	21.6
Dec. 7.	do	25.0	20.3	1.06	1.68	21.5
Dec. 14.	do	26.5	18.3	1.00	1.50	18.3
Dec. 28.	do	18.0	9.9	0.99	1.70	9.82

## DAILY GAUGE-HEIGHT AND DISCHARGE of Lee Creek at Cardston, for 1911.

DAY.	May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.00	242	2.30	⑤384	1.90	185
2.....	2.00	242	2.30	384	1.90	185
3.....	2.00	242	2.30	384	1.80	160
4.....	2.00	242	2.20	332	1.80	160
5.....	2.10	284	2.20	332	1.80	160
6.....	2.10	284	2.10	264	1.70	①136
7.....	2.00	242	2.00	220	1.60	118
8.....	2.00	242	2.00	210	1.60	118
9.....	2.00	242	2.00	205	1.50	94
10.....	2.00	242	2.00	200	1.35	64
11.....	2.00	242	2.00	200	1.25	49
12.....	2.00	242	2.00	200	1.25	49
13.....	2.10	284	1.90	170	1.25	49
14.....	2.30	384	1.90	170	1.25	49
15.....	4.00	1,400	1.90	171	1.25	49
16.....	3.20	920	1.90	171	1.25	49
17.....	2.60	560	1.90	172	1.25	49
18.....	2.40	440	1.90	172	1.35	64
19.....	2.30	384	1.90	172	1.35	64
20.....	2.20	332	1.90	173	1.35	64
21.....	2.10	284	1.80	140	1.25	49
22.....	2.10	284	1.80	140	1.25	49
23.....	2.10	284	1.80	140	1.25	49
24.....	2.10	284	2.30	345	1.30	56
25.....	2.20	332	2.50	464	1.30	56
26.....	2.20	332	2.50	464	1.30	56
27.....	2.20	332	2.22	316	1.30	56
28.....	2.10	284	2.00	220	1.30	56
29.....	2.10	284	1.90	180	1.40	73
30.....	2.20	332	1.90	180	1.50	94
31.....	2.20	332	.....	.....	1.40	73

⑤ Shifting conditions June 1 to July 6.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Lee Creek, at Cardston, for 1911.

DAY.	August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.30	56	1.20	43	1.70	144
2.....	1.40	73	1.20	43	1.70	144
3.....	1.40	73	1.30	56	1.70	144
4.....	1.50	94	2.65	590	1.70	144
5.....	1.50	94	2.55	530	1.70	144
6.....	1.70	144	2.35	412	1.70	144
7.....	1.80	174	2.10	284	1.60	118
8.....	1.90	206	2.20	332	1.60	118
9.....	1.90	206	2.20	332	1.60	118
10.....	1.80	174	2.30	384	1.60	118
11.....	1.80	174	2.30	384	1.60	118
12.....	1.65	131	2.40	440	1.50	94
13.....	1.50	94	2.40	440	1.50	94
14.....	1.40	73	2.20	332	1.50	94
15.....	1.40	73	2.00	242		
16.....	1.30	56	1.90	206		
17.....	1.30	56	1.90	206		
18.....	1.30	56	1.90	206		
19.....	1.30	56	1.80	174		
20.....	1.30	56	1.70	144		
21.....	1.30	56	1.70	144		
22.....	1.30	56	1.80	174		
23.....	1.30	56	1.80	174		
24.....	1.30	56	1.80	174		
25.....	1.45	83	1.70	144		
26.....	1.40	83	1.70	144		
27.....	1.40	83	1.70	144		
28.....	1.30	56	1.70	144		
29.....	1.30	56	1.70	144		
30.....	1.30	56	1.70	144		
31.....	1.30	56				



## DAILY GAUGE-HEIGHT AND DISCHARGE of Lee Creek, at Cardston, for 1912.

DAY.	August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.10	32	1.02	25	1.02	25	1.02	25	1.18	20
2.....	1.20	43	1.02	25	1.02	25	1.02	25	1.17	20
3.....	1.30	56	1.02	25	1.02	25	1.02	25	1.25	20
4.....	1.30	56	1.02	25	1.02	25	1.02	25	1.20	20
5.....	1.30	56	1.02	25	1.02	25	1.02	25	1.28	21
6.....	1.20	43	1.02	25	1.02	25	1.02	25	1.37	21
7.....	1.20	43	1.02	25	1.02	25	1.02	25	1.37	21
8.....	1.10	32	1.02	25	1.02	25	1.02	25	1.44	21
9.....	1.10	32	1.02	25	1.22	45	1.02	25	1.38	20
10.....	1.10	32	1.02	25	1.18	41	1.22	45	1.34	20
11.....	1.10	32	1.02	25	1.02	25	1.12	34	1.34	20
12.....	1.10	32	1.02	25	1.02	25	1.12	34	1.33	19.0
13.....	1.10	32	1.12	34	1.02	25	1.02	25	1.47	19.0
14.....	1.10	32	1.12	34	1.02	25	1.12	34	1.42	18.0
15.....	1.10	32	1.02	25	1.02	25	1.02	25	1.40	18.0
16.....	1.10	32	1.02	25	1.02	25	1.22	45	1.37	17.0
17.....	1.10	32	1.02	25	1.02	25	1.12	34	1.37	17.0
18.....	1.00	23	1.02	25	1.02	25	1.12	34	1.45	16.0
19.....	0.98	21	1.02	25	1.02	25	1.12	34	1.52	16.0
20.....	0.96	20	1.02	25	1.02	25	1.02	25	1.42	15.0
21.....	0.94	18	1.02	25	1.02	25	1.02	25	1.47	15.0
22.....	0.92	17	1.02	25	1.02	25	1.02	25	1.54	14.0
23.....	0.92	17	1.02	25	1.02	25	1.02	25	1.57	14.0
24.....	0.92	17	1.02	25	1.02	25	1.04	26	1.47	13.0
25.....	0.82	13	1.02	25	1.02	25	1.02	25	1.42	12.0
26.....	0.82	13	1.02	25	1.02	25	0.97	21	1.57	12.0
27.....	0.82	13	1.02	25	1.02	25	1.07	15.0①	1.52	11.0
28.....	0.92	17	1.02	25	1.02	25	1.07	15.0	1.62	10.0
29.....	0.92	17	1.02	25	1.02	25	1.12	18.0	1.57	10.0
30.....	0.92	17	1.02	25	1.02	25	1.14	20	1.72	10.0
31.....	0.92	17	.....	.....	1.02	25	.....	.....	1.72	10.0②

No observations taken during the early part of the season.

① Ice conditions Nov. 27 to Dec. 31. Discharge approximate.

## MONTHLY DISCHARGE of Lee Creek, at Cardston, for 1911-12.

(Drainage area 118 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911.						
May.....	1,400	242	357	3.03	3.49	21,951
June.....	464	140	242	2.05	2.29	14,400
July.....	185	49	83.3	0.706	0.81	5,122
August.....	206	56	90.8	0.770	0.89	5,583
September.....	590	43	244	2.07	2.31	14,519
October (1 to 14).....	144	94	124	1.05	0.55	3,444
The period.....					10.34	65,019
1912.						
August.....	56	13.0	28.7	0.244	0.78	1,765
September.....	34	25	25.6	0.217	0.24	1,523
October.....	45	25	26.2	0.222	0.26	1,611
November.....	45	15.0	27.0	0.229	0.26	1,607
December.....	21	10.0	16.5	0.139	0.16	1,014
The period.....					1.20	7,520

SESSIONAL PAPER No. 25d

## ST. MARY RIVER AT WHITNEY'S RANCH.

This station was established on October 13, 1911, by H. R. Carscallen. It is located on the N. E.  $\frac{1}{4}$  Sec. 26, Tp. 7, Rge. 22, W. 4th Mer., near W. D. Whitney's house, and is about ten miles from Lethbridge Post Office.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to a post sunk in the bed of the river at the right bank. The zero of the gauge (elev. 89.13), is referred to a permanent iron bench mark (assumed elev. 100.00), near Mr. Whitney's house.

The channel is straight for 900 feet above and 1,000 feet below the station. The right bank is low and may overflow during flood stage of the stream. The left bank is high, and will not overflow. The bed of the stream is composed of gravel and is not liable to shift.

Discharge measurements are made by means of a cable car, tagged wire and stay wire. The initial point for soundings is a spike driven into the downstream sill of the tower on the left bank.

During 1911 and 1912, the gauge was read by Mr. W. D. Whitney.

## DISCHARGE MEASUREMENTS of St. Mary River at Whitney's Ranch, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
Oct. 28.....	N. M. Sutherland.....	177.0	249.88	2.25	0.53	561.40
Nov. 29.....	D. D. Macleod.....	190.0	214.40	1.40	0.73	297.84
Dec. 15.....	do.....	180.0	151.55	1.32	0.50	199.34
1912.						
Jan. 12.....	D. McLeod.....	90	225.0	1.05	1.49	235.43
Jan. 30.....	do.....	190	148.6	1.32	1.56	196.08
Feb. 15.....	do.....	230	163.8	1.07	1.35	174.55
Mar. 1.....	do.....	220	142.5	1.06	1.20	151.47
Mar. 20.....	do.....	150	94.1	1.05	1.20	98.34
April 17.....	N. McL. Sutherland.....	195	299.2	2.75	0.63	821.80
May 15.....	A. W. P. Lowrie.....	305	489.1	3.96	1.12	1,940.00
June 8.....	do.....	277	457.8	3.58	1.03	1,637.24
June 29.....	do.....	272	473.2	3.83	1.08	1,814.00
July 14.....	do.....	258	306.1	4.51	0.93	1,380.86
Aug. 9.....	do.....	205	318.8	2.74	0.64	865.39
Aug. 30.....	do.....	181	197.7	2.28	0.33	451.54
Sept. 21.....	do.....	171	171.3	2.16	0.21	369.84
Oct. 11.....	do.....	175	204.3	2.34	0.35	478.00
Oct. 30.....	do.....	184	251.0	2.25	0.44	565.00
Nov. 25.....	V. Meek.....	177	206.0	2.20	0.44	454.50
Dec. 10.....	do.....	129	130.9	2.16	0.31	283.54
Dec. 31.....	do.....	223	273.0	0.58	0.49	157.00

## DAILY GAUGE-HEIGHT AND DISCHARGE of St. Mary River, at Whitney's Ranch, for 1911.

DAY.	October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			0.30	435	0.80	325
2.....			0.30	435	0.80	325
3.....			0.40	520	0.50	200
4.....			0.40	520	0.60	240
5.....			0.40	520	0.60	240
6.....			0.30	435	0.65	260
7.....			0.40	520	0.65	260
8.....			0.05	305	0.60	240
9.....			0.05	305	0.60	240
10.....			0.05	305	0.60	240
11.....			0.05	305	0.60	240
12.....			0.05	305	0.50	200
13.....	0.30	435	0.05	305	0.50	200
14.....	0.45	578	0.60	770	0.50	200
15.....	0.45	578	0.60	770	0.50	200
16.....	0.45	578	1.00	1,570	0.50	200
17.....	0.43	554	1.00	1,570	0.50	200
18.....	0.30	435	1.05	1,710	0.50	200
19.....	0.43	554	0.80	1,110	0.50	200
20.....	0.43	554	1.00	1,570	0.60	240
21.....	0.43	554	1.00	1,570	0.60	①215
22.....	0.43	554	0.90	1,330②	0.80	275
23.....	0.43	554	0.75	935	0.80	250
24.....	0.43	554	0.75	850	0.90	270
25.....	0.43	554	0.70	695	0.90	245
26.....	0.43	554	0.75	665	0.80	185
27.....	0.43	554	0.73	535	0.70	120
28.....	0.43	554	0.73	420	0.70	95
29.....	0.40	520	0.73	295	0.80	115
30.....	0.40	520	0.80	325	0.90	130
31.....	0.30	435			0.90	110

① Shifting conditions from Nov. 22 to Nov. 29, due to ice.

② Shifting conditions from Dec. 21 to Dec. 31, due to ice.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of St. Mary River at Whitney's Ranch, for 1912.

DAY.	January.		February.		March.		April		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.00	116	1.50	240	0.94	114	.....	.....	0.81	1,132	1.18	2,098
2.....	1.00	116	1.42	204	0.90	112	.....	.....	0.84	1,198	1.14	1,974
3.....	1.00	116	1.42	204	1.40	195	.....	.....	0.85	1,220	1.14	1,974
4.....	1.00	116	1.50	240	1.30	160	0.78	①1,074	0.85	1,220	1.12	1,912
5.....	1.10	120	1.50	240	0.44	94	0.70	930	0.83	1,176	1.11	1,881
6.....	1.20	135	1.49	236	0.40	92	0.68	898	0.86	1,242	1.11	1,881
7.....	1.20	135	1.49	236	0.40	92	0.70	930	0.98	1,522	1.10	1,850
8.....	1.20	135	1.49	236	1.10	120	0.70	930	1.01	1,598	1.08	1,794
9.....	1.40	195	1.60	300	1.10	120	0.71	948	1.03	1,634	1.02	1,626
10.....	1.49	236	1.60	300	1.20	135	0.70	930	1.05	1,710	1.02	1,626
11.....	1.49	236	1.40	195	1.10	120	0.70	930	1.05	1,710	1.31	2,534
12.....	1.49	236	1.40	195	1.11	122	0.68	898	1.08	1,794	1.34	2,636
13.....	1.49	236	1.40	195	1.07	119	0.68	898	1.14	1,974	1.38	2,772
14.....	1.51	246	1.46	222	1.03	117	0.70	930	1.17	2,067	1.38	2,772
15.....	1.52	252	1.49	236	1.00	116	0.70	930	1.19	2,129	1.40	2,840
16.....	1.66	342	1.50	240	1.00	116	0.70	930	1.24	2,296	1.10	1,850
17.....	1.65	335	1.56	276	1.10	120	0.73	984	1.29	2,466	1.08	1,794
18.....	1.65	335	1.40	195	1.10	120	0.74	1,002	1.37	2,738	1.07	1,766
19.....	1.70	370	1.40	195	1.10	120	0.70	930	1.35	2,670	1.07	1,766
20.....	1.75	420	1.60	300	1.20	135	0.68	898	1.35	2,670	1.06	1,738
21.....	1.89	578	1.60	300	1.20	135	0.68	898	1.32	2,568	1.06	1,738
22.....	1.89	578	1.60	300	1.20	135	0.68	898	1.28	2,432	1.04	1,682
23.....	1.85	530	1.20	135	2.08	①195	0.70	930	1.27	2,398	1.19	2,129
24.....	1.60	300	1.20	135	2.00	160	0.72	966	1.23	2,262	1.19	2,129
25.....	1.60	300	1.20	135	2.08	195	0.72	966	1.24	2,296	1.17	2,067
26.....	1.54	264	1.10	120	2.30	240	0.75	1,020	1.23	2,262	1.08	1,794
27.....	1.54	264	1.00	116	①	.....	0.75	1,020	1.23	2,262	1.50	3,190
28.....	1.54	264	1.00	116	.....	.....	0.75	1,020	1.22	2,228	1.29	2,466
29.....	1.52	252	1.00	116	.....	.....	0.77	1,056	1.19	2,129	1.13	1,943
30.....	1.42	204	.....	.....	.....	.....	0.78	1,074	1.20	2,160	1.15	2,005
31.....	1.42	204	.....	.....	.....	.....	.....	.....	1.18	2,098	.....	.....

① Water over ice from March 23 to 26.

② Gauge carried out by ice. New gauge put in on April 4.

③ River clear from ice.

DAILY GAUGE-HEIGHT AND DISCHARGE of St. Mary River at Whitney's Ranch, for 1912.  
*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.11	1,881	1.08	1,794	0.39	512	0.11	325	0.45	578	0.43	415
2.....	1.11	1,881	0.98	1,522	0.39	512	0.07	311	0.46	589	0.42	405
3.....	1.09	1,822	0.88	1,286	0.37	494	0.04	302	0.46	589	0.40	390
4.....	1.08	1,794	0.86	1,242	0.38	503	0.06	308	0.44	566	0.38	365
5.....	1.08	1,794	0.84	1,198	0.38	503	0.31	444	0.43	554	0.36	350
6.....	1.08	1,794	0.77	1,056	0.37	494	0.27	416	0.40	520	0.36	340
7.....	1.08	1,794	0.74	1,002	0.37	494	0.26	409	0.38	503	0.34	320
8.....	1.08	1,794	0.68	898	0.36	486	0.26	409	0.36	486	0.32	310
9.....	1.08	1,794	0.64	834	0.35	478	0.26	409	0.36	486	0.26	285
10.....	1.11	1,881	0.59	756	0.32	452	0.31	444	0.36	486	0.31	290
11.....	1.11	1,881	0.58	743	0.32	452	0.35	478	0.39	512	0.33	285
12.....	1.13	1,943	0.58	743	0.33	460	0.36	486	0.41	532	0.35	280
13.....	1.11	1,881	0.57	730	0.32	452	0.36	486	0.43	554	0.36	275
14.....	0.93	1,402	0.57	730	0.32	452	0.36	486	0.51	648	0.46	305
15.....	0.98	1,522	0.55	703	0.31	444	0.35	478	0.50	635	0.56	330
16.....	0.88	1,286	0.55	703	0.31	444	0.34	469	0.51	648	0.55	320
17.....	0.82	1,154	0.54	689	0.30	435	0.31	444	0.51	648	0.53	300
18.....	0.81	1,132	0.53	676	0.30	435	0.31	444	0.46	589	0.50	270
19.....	0.80	1,110	0.52	662	0.27	416	0.31	444	0.44	566	0.46	250
20.....	0.78	1,074	0.52	662	0.26	409	0.36	486	0.40	520	0.46	240
21.....	0.78	1,074	0.48	612	0.25	402	0.41	532	0.38	480	0.47	235
22.....	0.78	1,074	0.44	566	0.22	383	0.46	589	0.36	445	0.46	220
23.....	0.82	1,154	0.41	532	0.21	376	0.46	589	0.36	430	0.46	210
24.....	0.86	1,242	0.38	503	0.20	370	0.46	589	0.40	440	0.45	200
25.....	0.88	1,286	0.68	898	0.19	365	0.46	589	0.44	450	0.44	195
26.....	1.28	2,432	0.68	898	0.19	365	0.46	589	0.45	460	0.45	190
27.....	1.58	3,470	0.68	898	0.18	360	0.46	589	0.46	465	0.45	180
28.....	1.28	2,432	0.67	882	0.17	355	0.46	589	0.46	455	0.46	175
29.....	1.28	2,432	0.64	834	0.16	350	0.45	578	0.45	445	0.46	170
30.....	1.18	2,098	0.63	818	0.16	350	0.44	566	0.43	420	0.44	160
31.....	1.18	2,098	0.63	818	.....	.....	0.44	566	.....	.....	0.46	150

③ Shifting conditions, due to ice, from Nov. 20 to Dec. 30.

MONTHLY DISCHARGE of St. Mary River, at Whitney's Ranch for 1911-12.

(Drainage area 1394 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911.						
October (13-31).....	578	435	535	0.384	0.27	20,162
November.....	1,570	295	730	0.524	0.58	43,438
December.....	325	95	215	0.154	0.18	13,220
The period.....					1.03	76,820
1912.						
January.....	578	116	263	0.189	0.22	16,171
February.....	300	116	212	0.152	0.16	12,194
March (1-26).....	240	92	134	0.096	0.09	6,911
April (4-30).....	1,074	898	949	0.681	0.68	50,822
May.....	2,738	1,132	1,977	1.42	1.64	121,564
June.....	3,190	1,626	2,074	1.48	1.65	123,410
July.....	3,470	1,074	1,723	1.24	1.43	105,943
August.....	1,794	503	867	0.622	0.72	53,310
September.....	512	350	433	0.311	0.35	25,765
October.....	580	302	479	0.343	0.40	29,453
November.....	648	420	523	0.375	0.42	31,121
December.....	415	150	271	0.194	0.22	16,663
The year.....					7.98	593,327

## SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS made in St. Mary River drainage basin, in 1911-12.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. feet.	Feet per Sec.	Sec.-ft.
1911							
May 2.....	L. J. Gleeson....	Boundary Creek...	11-1-26-4.....	22.6	27.1	0.830	22.8
" 20.....	do .....	do .....	do .....	21.5	34.4	1.20	54.5
June 22.....	do .....	do .....	do .....	21.5	28.7	0.93	26.7
" 28.....	do .....	do .....	do .....	21.6	34.5	1.26	43.3
July 14.....	do .....	do .....	do .....	21.5	23.1	0.55	12.7
" 22.....	do .....	do .....	do .....	21.7	23.9	0.54	13.0
Aug. 18.....	do .....	do .....	do .....	21.3	22.2	0.91	20.1
" 31.....	do .....	do .....	do .....	21.8	20.8	0.53	11.2
Oct. 9.....	do .....	do .....	do .....	17.0	33.4	1.03	34.3
May 20.....	do .....	St. Mary River....	5-1-25-4.....	118.	514.4	5.28	3,717
" 20.....	do .....	do .....	do .....	118.	514.86	6.02	2,635
June 28.....	do .....	do .....	do .....	115.	553.0	5.90	3,264
July 4.....	do .....	do .....	11-3-25-4.....	169.	611.4	4.33	2,645
" 14.....	do .....	do .....	5-1-25-4.....	109	383.9	4.19	1,607
" 25.....	do .....	do .....	11-3-25-4.....	244.	442.2	2.13	942
Aug. 8.....	do .....	do .....	5-1-25-4.....	107.2	355.9	3.83	1,362
" 18.....	do .....	do .....	do .....	95.5	320.3	3.00	962
" 31.....	do .....	do .....	do .....	104.0	270.8	2.34	634
Sept. 9.....	do .....	do .....	11-3-25-4.....	150.9	546.6	4.03	2,201
Oct. 9.....	do .....	do .....	5-1-25-4.....	106.0	278.4	2.35	666
" 13.....	do .....	do .....	11-3-25-4.....	119.3	324.8	1.03	335
1912							
May 7.....	L. J. Gleeson....	Boundary Creek...	11-1-26-4.....	24.0	29.3	1.00	29.3
June 5.....	do .....	do .....	do .....	24.5	24.5	0.73	18.0
" 20.....	do .....	do .....	do .....	14.5	18.2	0.52	9.5
July 23.....	V. Meek.....	do .....	do .....	21.5	24.0	1.56	37.5
Aug. 8.....	do .....	do .....	do .....	11.7	6.6	0.96	11.2
" 29.....	do .....	do .....	do .....	16.2	7.1	1.09	7.8
Oct. 24.....	G. F. Deas.....	do .....	do .....	14.0	8.4	1.75	14.8
Nov. 18.....	V. Meek.....	do .....	do .....	9.5	4.8	2.14	10.3
May 27.....	L. J. Gleeson....	Snake Creek.....	S.W. 23-2-25-4.....	3.0	2.58	6.28	0.72
April 27.....	do .....	St. Mary River....	N.W. 23-3-25-4.....	127.0	412.6	2.12	875.
June 7.....	do .....	do .....	N.W. 11-3-25-4.....	136.0	526.3	3.21	1,700.
July 6.....	do .....	do .....	do .....	124.3	474.3	2.93	1,390.
" 27.....	V. Meek.....	do .....	do .....	125.4	527.9	3.01	1,389.
Aug. 13.....	do .....	do .....	do .....	121.5	369.9	1.67	618.
Oct. 10.....	G. F. Deas.....	do .....	N.E. 25-1-25-4.....	113.0	343.0	1.32	454.
Nov. 4.....	V. Meek.....	do .....	do .....	114.0	348.4	1.22	426.
Sept. 2.....	do .....	do .....	S.E. 18-2-27-4.....	110.5	309.0	0.97	300.

## MILK RIVER DRAINAGE BASIN.

*General Description.*

Milk River rises on the eastern slope of the foothills in the Blackfoot Indian Reserve in the United States. Its headwaters run down in two main streams which are known, after entering Canada, as the north and south branches. The north branch runs in a northeasterly direction through the Blackfoot Reserve for a distance of about 15 miles and then enters Canada near the quarter mound on the south side of Section 3, Township 1, Range 23, West of the 4th Meridian. From the international boundary the stream continues in a northeasterly direction for about nine miles, when it bends to the east and runs in an easterly direction through the second tier of townships to its junction with the south branch at the centre of Section 20, Township 2, Range 18, West of the 4th Meridian.

The south branch runs to the south and east of, and parallels the north branch for a distance of about 48 miles, as the crow flies, through the Blackfoot Reserve and then enters Canada near the quarter mound on the south side of Section 1, Township 1, Range 20, West of the 4th Meridian. From the international boundary it runs in a northeasterly direction to its junction with the north branch. From the junction of the two branches Milk River runs in an easterly direction through the second tier of townships in Canada to the east boundary of Range 7. From this point the river runs in a southeasterly direction to its first point of crossing the international boundary into the United States. This first point of crossing is near the quarter mound on the south side of Section 3, Township 1, Range 5, West of the 4th Meridian. From this point the river meanders in an easterly direction through Canada and the United States to a point on the international boundary about 900 feet west of the east boundary of Section 1, Township 1, Range 5, West of the 4th Meridian where it finally crosses into the United States. This point is known as the "Eastern Crossing." The length of the course of Milk River in Canada from the western crossing of the north branch to the eastern crossing is 179 miles. The length of the course of the south branch in Canada is 20 miles.

Throughout its course in Canada from the western crossing of the north branch to the eastern crossing, Milk River runs through a well defined valley bordered on each side by a range of hills. The whole of its watershed in Canada is bald prairie land. The river receives a number of small tributary creeks along its course, all of which discharge a considerable volume of water during the spring freshets. Usually they all dry up by about July 1, and have no considerable discharge again until late in the fall, when some of them have a small flow for perhaps a month before the freeze up.

The general conditions of flow in the river are such as are typical of all rivers which have a watershed devoid of tree growth; that is, it is subject to extreme floods during the freshet period and to correspondingly low flow during the summer months. From its headwaters to the eastern crossing the total area of the watershed of Milk river is 2,448 square miles. Of this total amount 1,645 square miles are in Canada and 803 square miles in the United States.

#### NORTH BRANCH OF MILK RIVER NEAR PETERS' RANCH.

This station was established by P. M. Sauder and F. H. Peters on July 21, 1909. It is located 150 feet upstream from the north boundary of the N.E.  $\frac{1}{4}$  Sec. 13, Tp. 1, Rge. 23, W. 4th Mer. It is seven miles by trail from Taylorville P.O., and 15 miles from Kimball.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the left bank. The zero (elev. 86.87) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the left bank, directly beneath the turnbuckle on the cable.

The stream flows in one channel, which is about 40 feet wide at ordinary stages. It is straight for about 200 feet above the station and is almost straight for about 300 feet below. Both banks are composed of solid clay. The right is high and not liable to overflow, but the left may overflow at extreme flood stage of the stream. The bed of the stream is composed of a layer of soft mud and stones over a solid clay foundation.

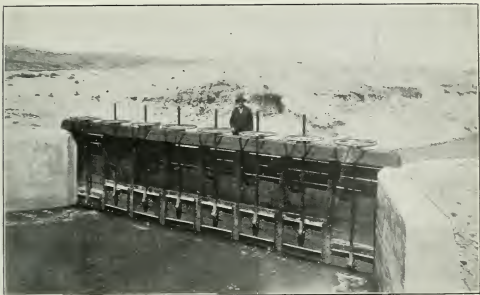
Discharge measurements are made during high water by means of a cable car, tagged wire and stay wire. The initial point for soundings is the face of a post on the left bank. At low water the discharge is measured by wading at a point about quarter of a mile downstream from the cable.

During 1911, the gauge was read by Bert Mecham from April 19 to September 25, and by Wm. Wheeler from September 25 to November 2. During 1912, it was read by Wm. Wheeler.

#### DISCHARGE MEASUREMENTS of North Branch Milk River, near Peters' Ranch, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911						
April 20.....	L. J. Gleeson.....	41.4	59.8	0.73	1.76	43.5
May 3.....	do.....	41.7	58.9	0.71	1.74	42.0
May 13.....	do.....	41.5	65.3	0.94	1.94	61.3
June 6.....	do.....	41.3	53.1	0.68	1.69	36.0
June 8.....	do.....	42.8	54.7	0.69	1.72	37.8
June 23.....	do.....	40.0	44.7	0.50	1.58	22.2
June 25.....	do.....	39.9	166.9	1.30	3.59	217.1
July 15.....	do.....	41.4	49.3	0.36	1.61	17.8
July 18.....	do.....	29.4	20.6	1.36	1.80	32.3
Aug. 9.....	do.....	41.2	56.1	0.88	2.09	49.0
Aug. 15.....	do.....	40.2	40.2	0.60	1.66	24.0
Sept. 1.....	do.....	20.7	14.2	1.79	1.61	25.6
Sept. 4.....	do.....	41.0	78.1	1.84	3.21	143.6
Sept. 25.....	do.....	41.0	51.9	0.75	1.91	38.8
Oct. 6.....	do.....	41.6	53.0	0.66	1.91	35.0
1912.						
April 24.....	L. J. Gleeson.....	41.4	55.6	0.78	1.92	43.60
May 8.....	do.....	42.0	57.6	0.85	1.91	49.10
May 10.....	do.....	42.0	58.1	0.91	1.91	53.10
May 31.....	do.....	40.5	52.2	0.67	1.85	34.90
June 2.....	do.....	40.5	52.0	0.62	1.82	32.50
June 21.....	do.....	①	.....	.....	1.83	22.90
July 18.....	G. F. Deas.....	41.5	56.2	0.92	2.22	51.90
July 19.....	V. Meek.....	41.0	51.0	0.56	2.09	28.50
Aug. 7.....	do.....	①	.....	.....	2.08	25.32
Aug. 26.....	do.....	①	.....	.....	1.99	23.80
Aug. 28.....	do.....	①	.....	.....	1.93	22.00
Sept. 18.....	do.....	①	.....	.....	1.89	21.25
Sept. 20.....	do.....	①	.....	.....	1.83	22.24
Sept. 20.....	do.....	①	.....	.....	2.02	29.10
Oct. 21.....	G. F. Deas.....	①	.....	.....	1.90	22.60
Oct. 28.....	V. Meek.....	①	.....	.....	1.89	24.80
Oct. 30.....	do.....	①	.....	.....	2.20	20.50
Nov. 19.....	do.....	①	.....	.....	1.94	28.60
Dec. 3.....	do.....	①	.....	.....	2.04	24.00

① Measurement not taken at regular station.



Headgates of Canadian Pacific Railway Company's Canal at Kimball, Alberta.  
Taken by L. J. Gleeson.



Shelter for Automatic Gauge on North Branch of Milk River at Peters' Ranch.  
Taken by V. Meek.





SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of North Branch Milk River, near Peters' Ranch, for 1911.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....		①	1.73	39	1.79	45	2.02	43
2.....			1.73	39	1.73	39	2.00	42
3.....			1.73	39	1.71	38	1.98	41
4.....			1.73	39	1.71	37	1.94	39
5.....			1.74	40	1.66	32	1.90	37
6.....			1.74	40	1.70	36	1.89	36
7.....			1.74	40	1.70	36	1.85	34
8.....			1.74	40	1.73	39	1.81	32
9.....			1.74	40	1.70	36	1.78	31
10.....			1.74	40	1.66	32	1.76	30
11.....			1.74	40	1.64	30	1.72	28
12.....			1.74	40	1.64	30	1.71	28
13.....			1.76	42	1.62	28	1.70	27
14.....			1.97	65	1.61	27	1.70	27
15.....			3.29	244	1.59	25	1.69	27
16.....			2.64	142	1.57	24	1.69	27
17.....			2.05	74	1.56	23	1.71	28
18.....		①	1.93	60	1.55	22	1.88	36
19.....	1.76	42	1.89	56	1.53	21	1.80	32
20.....	1.76	42	1.86	53	1.53	21	1.74	29
21.....	1.78	44	1.83	49	1.86	53	1.74	29
22.....	1.78	44	1.94	61	1.80	46	2.54	77
23.....	1.89	56	1.77	43	4.86	555	1.99	42
24.....	2.39	111	2.85	172	3.96	308	1.96	40
25.....	2.29	100	2.25	96	4.22	375	1.91	38
26.....	2.19	89	1.79	45	2.68	87	1.87	36
27.....	2.09	78	1.73	39	2.37	65	1.82	33
28.....	1.89	56	1.72	38	2.09	47	1.79	32
29.....	1.73	39	1.71	37	1.98	41	1.74	29
30.....	1.73	39	1.71	37	2.19	53	2.50	74
31.....			1.71	37			1.98	41

① No gauge heights read before April 19.

DAILY GAUGE-HEIGHT AND DISCHARGE of North Branch Milk River, near Peters' Ranch, for 1911.  
*Concluded.*

DAY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.88	36	1.63	24	1.87	36	2.02	43
2.....	1.86	35	1.63	24	1.90	37	2.02	43
3.....	2.03	44	1.64	25	1.85	34		
4.....	3.18	139	3.21	144	1.80	32		
5.....	2.95	112	3.52	202	1.98	41		
6.....	2.60	81	3.15	136	1.91	38		
7.....	2.42	68	2.94	111	1.90	37		
8.....	2.18	53	2.85	102	1.88	36		
9.....	2.21	55	2.82	100	1.87	36		
10.....	2.16	52	2.76	94	1.86	35		
11.....	2.09	47	2.76	94	1.86	35		
12.....	1.93	38	2.72	91	1.84	34		
13.....	1.88	36	2.64	84	1.83	34		
14.....	1.81	32	2.50	74	1.86	35		
15.....	1.71	28	2.42	68	1.88	36		
16.....	1.71	28	2.20	54	1.88	36		
17.....	1.70	27	2.01	43	1.87	36		
18.....	1.70	27	1.99	42	1.86	35		
19.....	1.69	27	1.98	41	1.90	37		
20.....	1.71	28	1.98	41	1.92	38		
21.....	1.72	28	1.97	40	1.90	37		
22.....	1.69	27	1.75	30	1.94	39		
23.....	1.70	27	1.85	34	1.94	39		
24.....	1.69	27	1.94	39	1.95	40		
25.....	1.68	26	1.94	39	1.94	39		
26.....	1.68	26	1.92	38	1.98	41		
27.....	1.66	25	1.90	37	2.04	44		
28.....	1.66	25	1.90	37	2.04	44		
29.....	1.65	25	1.88	36	2.05	45		
30.....	1.64	25	1.86	35	2.04	44		
31.....	1.63	24			2.00	42		

## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of North Branch Milk River, near Peters' Ranch, for 1912.

DAY.	April.		May.		June.		July.		August.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.02	①	1.96	50	1.88	36	2.14	46	1.98	23
2.....	2.06		1.97	51	1.86	35	2.19	49	2.06	26
3.....	1.90		1.97	51	1.83	31	2.16	46	2.02	25
4.....	1.84		1.96	51	1.81	30	2.12	43	1.98	23
5.....	1.70		1.96	51	1.80	30	2.06	38	1.96	23
6.....	1.67		1.96	52	1.80	28	1.99	33	1.94	22
7.....	1.71		1.94	50	1.80	28	1.97	31	1.95	22
8.....	1.74	①	1.94	51	1.79	27	2.48	69	1.93	22
9.....	1.82	37	1.93	52	1.89	31	2.32	53	1.93	22
10.....	1.97	47	1.92	54	1.89	31	2.31	52	1.92	22
11.....	2.02	51	1.92	53	1.88	30	2.24	45	1.94	22
12.....	2.07	55	1.92	53	1.88	28	2.18	40	1.94	22
13.....	2.09	57	1.91	51	1.88	28	2.26	44	1.92	22
14.....	2.07	55	1.89	49	1.87	27	2.21	40	1.92	22
15.....	2.04	53	1.88	48	1.92	29	2.21	39	1.91	21
16.....	2.04	53	1.86	45	2.02	34	2.13	33	1.98	23
17.....	2.03	52	1.86	45	2.01	33	2.12	31	1.92	22
18.....	2.03	52	1.85	44	1.98	30	2.10	29	1.90	21
19.....	2.02	51	1.82	41	1.95	27	2.08	25	1.89 ①	21
20.....	2.02	51	1.91	46	1.95	27	2.12	27	1.88	21
21.....	2.01	50	2.41	93	1.92	27	2.58	58	1.87	20
22.....	2.00	50	2.97	180	1.91	28	2.62	62	1.88	21
23.....	1.98	48	2.62	116	1.91	29	2.73	72	1.86	20
24.....	1.98	49	2.41	89	1.90	29	2.60	60	1.86	20
25.....	1.98	49	2.18	64	1.90	30	2.42	46	1.86	20
26.....	1.99	51	2.04	52	1.89	30	2.28	37	1.84	20
27.....	1.98	50	1.98	46	1.87	29	2.12	27	1.85	20
28.....	1.97	50	1.98	45	1.89	30	2.06	25	1.84	20
29.....	1.98	51	1.97	43	1.98	35	1.99	23	1.84	20
30.....	1.98	52	1.94	41	2.24	54	1.97	22	1.82	20
31.....			1.91	39			1.94	22	1.83	20

① Ice jam.

② Gauge height interpolated.

DAILY GAUGE-HEIGHT AND DISCHARGE of North Branch Milk River, near Peters' Ranch, for 1912.  
*Concluded.*

DAY.	September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.85	21	1.92	24	2.39	28	1.86	20
2.....	1.83	20	1.91	24	2.43	33	1.86	20
3.....	1.88	22	1.90	24	2.47	37	2.04	24
4.....	2.02	27	1.88	23	2.44	32	2.04	②
5.....	2.04	28	1.87	23	2.43	38	2.03	.....
6.....	2.02	27	1.86	23	2.46	42	2.05	.....
7.....	2.06	29	1.87	23	2.41	40	2.05	.....
8.....	2.03	28	1.89	23	2.39	41	2.05	.....
9.....	1.97	25	1.91	24	2.36	40	2.07	.....
10.....	1.92	24	1.93	25	2.34	41	2.09	.....
11.....	1.89	23	1.98	27	2.34	42	2.11	.....
12.....	1.88	23	2.02	29	2.19	34	2.11	.....
13.....	1.86	22	2.00	28	2.08	28	2.14	.....
14.....	1.86	22	1.97	26	1.99	26	2.16	.....
15.....	1.82	21	1.96	26	2.04	29	2.16	.....
16.....	1.83	22	1.97	26	2.08	33	2.18	.....
17.....	1.83	22	1.98	26	2.20	41	2.19	.....
18.....	1.88 ②	23	2.01	28	2.19	42	2.19	.....
19.....	1.93 ②	26	1.98	26	2.19 ②	43	2.10	.....
20.....	1.98	27	1.92	24	2.19	43	2.18	.....
21.....	2.04	30	1.84	21	2.17	41	2.32	.....
22.....	2.06	31	1.86	22	2.14	38	2.32	.....
23.....	2.08	32	1.98	27	2.08	33	2.39	.....
24.....	2.04	30	2.13	36	2.01	29	2.45 ②	.....
25.....	2.00	28	2.10	34	1.99	28	2.50	.....
26.....	1.98	27	2.08	33	1.96	25	2.52	.....
27.....	1.99	28	2.03	31	1.94	24	2.53	.....
28.....	1.96	26	2.13	38	1.91	22	2.53	.....
29.....	1.93	25	2.24	31	1.89	22	2.55	.....
30.....	1.92	24	2.31	24	1.88	21	2.54	.....
31.....			2.38	28			2.57	.....

② Gauge height interpolated.

③ No discharge measurements under ice conditions.

## SESSIONAL PAPER No. 25d

## MONTHLY DISCHARGE of North Branch Milk River, near Peters' Ranch, for 1911-12.

(Drainage area 109 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911.						
April (19-30) . . . . .	111	39	61.7	0.566	0.25	1,468
May . . . . .	244	37	60.2	0.552	0.64	3,702
June . . . . .	555	21	75.0	0.688	0.77	4,463
July . . . . .	77	27	36.3	0.333	0.38	2,232
August . . . . .	139	24	41.2	0.378	0.44	2,533
September . . . . .	202	24	65.3	0.599	0.67	3,886
October . . . . .	45	32	37.8	0.347	0.40	2,324
November (1-2) . . . . .	43	43	43.0	0.394	0.03	171
The period . . . . .					3.58	20,779
1912.						
April (9-30) . . . . .	57	37	50.6	0.465	0.38	2,210
May . . . . .	180	39	57.9	0.531	0.61	3,560
June . . . . .	54	27	30.7	0.282	0.31	1,827
July . . . . .	72	22	40.9	0.375	0.43	2,515
August . . . . .	26	20	21.5	0.197	0.23	1,322
September . . . . .	32	20	25.4	0.233	0.26	1,511
October . . . . .	38	21	26.7	0.245	0.28	1,642
November . . . . .	43	21	33.9	0.311	0.35	2,017
December (1-3) . . . . .	24	20	21.3	0.195	0.02	127
The period . . . . .					2.87	16,731

## NORTH BRANCH OF MILK RIVER NEAR MACKIE'S RANCH.

This station was established July 16, 1909, by P. M. Sauder and F. H. Peters. It is located on the S.W.  $\frac{1}{4}$  Sec. 19, Tp. 2, Rge. 18, W. 4th Mer. It is 17 miles by trail from Milk River, three miles north of Mackie Brothers' buildings, and one mile west of the junction of the north and south branches.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post on the right bank. The zero (elev. 91.50) is referred to a permanent iron bench mark (assumed elev. 100.00), located 25 feet from the edge of the right bank, and under the cable.

The stream flows in one channel, which at ordinary stages is about 60 feet wide. It is straight for 200 feet above and about 150 feet below the station. Both banks are low and liable to overflow at high stages. The bed of the stream is composed of gravel and is constantly changing.

Discharge measurements are made by means of a cable car, tagged wire, and stay wire. The initial point for soundings is the face of a cedar post planted in the north bank and marked "O + OO."

As it was impossible to secure an observer the gauge was not read during 1912.

## DISCHARGE MEASUREMENTS of North Branch of Milk River, near Mackie's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 14. . . . .	J. E. Degnan . . . . .	61	73.6	0.51	1.95	37.62
June 25. . . . .	do . . . . .				1.84	22.27 ①
July 11. . . . .	do . . . . .	62	82.0	0.69	2.10	56.57
Aug. 17. . . . .	do . . . . .				1.86	27.10 ①
Oct. 14. . . . .	do . . . . .				2.00	43.30 ①

① Not taken at regular station.

## SOUTH BRANCH OF MILK RIVER AT MACKIE'S RANCH.

This station was established July 14, 1909, by P. M. Sauder and F. H. Peters. It is 17 miles by trail from Milk River and is located on the N.W.  $\frac{1}{4}$  Sec. 31, Tp. 1, Rge. 18, W. 4th Mer., about one quarter mile upstream from Mackie Brothers' ranch buildings, and is about five miles upstream from the junction of the north and south branches of Milk River.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the left bank. The zero of the gauge (elev. 86.00) is referred to a permanent iron bench mark (assumed elev. 100.00), located on the left bank, directly under the cable and five feet from the initial point of soundings.

The stream flows in one channel and is straight for about 150 feet above the station and for 100 feet below. The right bank is composed of sand and gravel and is liable to overflow. The left bank is composed of clay and is high. The bed of the stream consists of gravel and sand and is liable to shift.

Discharge measurements are made during high stages by means of a cable car, tagged wire, and stay wire, and at low stages by wading. The initial point for soundings is the face of a cedar post planted in the left bank.

During 1912 the gauge was read by Mrs. F. Cathro.

#### DISCHARGE MEASUREMENTS of South Branch of Milk River at Mackie's Ranch, in 1912.

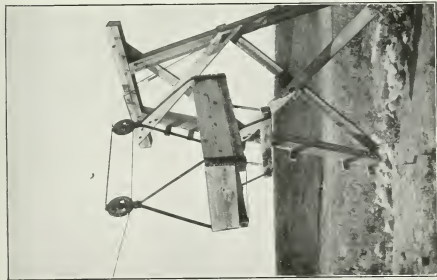
Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 19.....	J. E. Degnan.....	88.0	117.50	1.45	3.08	170.65
May 15.....	do.....	87.0	108.70	1.24	2.84	134.70
June 5.....	do.....	86.0	94.35	1.05	2.69	99.15
June 25.....	do.....	59.0	63.90	0.69	2.30	44.26
July 12.....	do.....	84.0	75.10	0.94	2.48	70.74
July 30.....	do.....	60.0	56.40	0.75	2.295	42.40
Aug. 17.....	do.....	58.0	48.20	0.60	2.10	29.05
Sept. 6.....	do.....	58.0	53.90	0.67	2.19	36.30
Sept. 25.....	do.....	60.0	57.40	0.73	2.25	42.05
Oct. 14.....	do.....	62.0	60.60	0.78	2.30	47.60
Nov. 6.....	do.....	59.0	56.30	0.74	2.255	41.73

#### DAILY GAUGE-HEIGHT AND Discharge of South Branch of Milk River, at Mackie's Ranch, for 1912

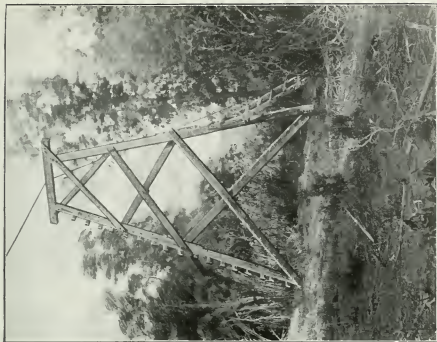
DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	①	.....	3.03	161	2.82	121	2.29	45
2.....	.....	.....	3.03	161	2.73	105	2.39	57
3.....	.....	.....	3.05	166	2.71	102	2.38	56
4.....	①	.....	3.04	163	2.70	100	2.37	54
5.....	4.03	449	3.04	163	2.66	94	2.34	51
6.....	3.71	341	3.03	161	2.69	98	2.32	48
7.....	3.35	236	2.99	153	2.69	98	2.34	51
8.....	3.47	269	2.97	149	2.69	98	2.41	59
9.....	3.50	278	3.03	161	2.67	96	2.50	71
10.....	3.46	266	3.02	159	2.67	96	2.65	92
11.....	3.50	278	3.01	157	2.65	92	2.70	100
12.....	3.75	354	3.01	157	2.62	88	2.42	61
13.....	3.76	357	2.98	151	2.62	88	2.38	56
14.....	3.50	278	2.86	128	2.62	88	2.37	54
15.....	3.02	159	2.84	124	2.60	85	2.36	53
16.....	3.02	159	2.83	122	2.59	84	2.36	53
17.....	3.01	157	2.83	122	2.56	79	2.35	52
18.....	3.04	163	2.82	121	2.56	79	2.35	52
19.....	3.09	174	2.83	122	2.54	77	2.35	52
20.....	3.08	172	2.84	124	2.53	75	2.34	51
21.....	3.07	170	3.70	338	2.52	74	2.34	51
22.....	3.06	168	4.60	669	2.49	70	2.38	56
23.....	3.06	168	4.30	549	2.39	57	2.69	98
24.....	3.07	170	3.98	431	2.34	51	2.76	110
25.....	3.07	170	3.70	338	2.30	46	2.73	105
26.....	3.06	168	3.57	298	2.29	45	2.72	103
27.....	3.06	168	3.44	261	2.29	45	2.60	85
28.....	3.07	170	3.26	213	2.28	44	2.40	58
29.....	3.05	166	3.04	163	2.28	44	2.32	48
30.....	3.05	166	2.99	153	2.28	44	2.30	46
31.....	.....	.....	2.91	137	.....	.....	2.29	45

① Ice conditions.

Not sufficient data to compute discharge.



Cable Support and Car at the Gauging Station on the  
South Branch of Milk River at Mackie's Ranch.  
Taken by F. Cathro.



Cable Support at the Gauging Station on Milk River  
at Pendant d'Oreille police detachment.  
Taken by F. H. Peters.





## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of South Branch of Milk River, at Mackie's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.26	42	1.99	21	2.23	40	2.29	45
2.....	2.28	44	1.98	21	2.22	39	2.29	45
3.....	2.30	46	1.99	21	2.22	39	2.28	44
4.....	2.35	52	2.08	28	2.00	22	2.26	42
5.....	2.37	54	2.20	37	2.19	36	2.24	41
6.....	2.39	57	2.21	38	2.16	34	2.22	39
7.....	2.41	59	2.24	41	2.16	34	2.22	39
8.....	2.37	54	2.26	42	2.18	35	2.24	41
9.....	2.35	52	2.19	36	2.20	37	2.22	39
10.....	2.31	47	2.16	34	2.23	40	2.24	41
11.....	2.29	45	2.14	32	2.29	45	2.26	42
12.....	2.25	42	2.11	30	2.32	48	2.29	45
13.....	2.20	37	2.06	26	2.31	47	2.28	44
14.....	2.18	35	2.03	24	2.30	46	2.28	44
15.....	2.17	35	2.02	23	2.30	46	2.29	45
16.....	2.14	32	2.02	23	2.29	45	2.27	43
17.....	2.10	29	2.01	23	2.29	45		
18.....	2.09	28	2.00	22	2.30	46		
19.....	2.08	28	2.06	26	2.31	47		
20.....	2.07	27	2.13	31	2.30	46		
21.....	2.05	26	2.18	35	2.30	46		
22.....	2.04	25	2.22	39	2.31	47		
23.....	2.04	25	2.23	40	2.29	45		
24.....	2.03	24	2.24	41	2.30	46		
25.....	2.03	24	2.28	42	2.30	46		
26.....	2.02	23	2.26	42	2.29	45		
27.....	2.02	23	2.25	42	2.28	44		
28.....	2.01	23	2.25	42	2.30	46		
29.....	2.01	23	2.24	41	2.31	47		
30.....	2.00	22	2.23	40	2.31	47		
31.....	1.99	21			2.30	46		

## MONTHLY DISCHARGE of South Branch of Milk River at Mackie's Ranch, for 1912.

(Drainage area 441 square miles).

MONTH	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (5-30).....	449	157	222.	0.503	0.49	11,453
May.....	669	121	209.	0.474	0.55	12,851
June.....	121	44	78.8	0.179	0.20	4,680
July.....	110	45	63.6	0.144	0.17	3,911
August.....	59	21	35.6	0.081	0.09	2,189
September.....	42	21	32.8	0.074	0.08	1,952
October.....	48	22	42.6	0.097	0.11	2,619
November (1-16).....	45	39	42.4	0.096	0.06	1,347
The period.....						41,011

## MILK RIVER AT MILK RIVER.

This station was established by H. C. Ritchie on May 18, 1909, and re-established by F. H. Peters on July 3, 1909. It is located on the N.W.  $\frac{1}{4}$  Sec. 21, Tp. 2, Rge. 16, W. 4th Mer., at the Canadian Pacific Railway bridge, one quarter of a mile south of the town of Milk River.

The gauge, which is of the standard chain type, is securely fastened to the railway bridge, above the centre of the stream. The zero of the gauge (elev. 90.97) is referred to a permanent iron bench mark (assumed elev. 100.00), located on the left bank, 20 feet upstream from the bridge and 30 feet from the bank.

The stream flows in one channel at all stages and in ordinary stages is not more than 140 feet wide. The channel is almost straight for 500 feet above and below the station. The right bank is sandy, fairly high, and not liable to overflow. The left bank is lower and overflows during high water. The bed of the stream is composed of sand and fine gravel which is constantly shifting.

Discharge measurements are made from the downstream side of the bridge at high water and in low water a wading section, about 50 feet upstream, is used.

During 1912, the gauge was read by Dan O'Connell.

## DISCHARGE MEASUREMENTS of Milk River at Milk River, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 23	D. D. McLeod	①			3.17	35.71
Feb. 10	do	①			3.60	73.60
Feb. 23	do	①			3.53	81.10
Mar. 9	do	①			3.07	55.20
April 3	do	①				1,090.02
April 16	J. E. Degnan	118	162.15	1.96	2.25	316.59
April 22	do	118	161.60	1.79	2.20	288.82
May 13	do	127	136.80	1.51	1.98	206.56
May 16	do	127	133.90	1.53	1.92	204.57
June 4	do	127	125.80	1.25	1.85	157.12
June 8	do	126	112.25	1.22	1.72	137.44
June 26	do	①			1.35	66.72
July 6	do	①			1.64	116.30
July 15	do	①			1.61	111.61
Aug. 2	do	①			1.41	64.13
Aug. 15	do	①			1.35	57.60
Aug. 19	do	①			1.51	82.90
Sept. 5	do	①			1.38	60.26
Sept. 10	do	①			1.37	60.25
Sept. 21	do	①			1.57	83.20
Sept. 26	do	①			1.53	86.04
Oct. 12	do	①			1.54	85.90
Oct. 16	do	①			1.53	85.25
Nov. 5	do	①			1.57	92.11

① Gauging made at wading section.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River at Milk River, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height	Dis-charge.	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height	Dis-charge.	Gauge Height	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2 30	47	3 70	66	3 32	70	.....	.....	2 05	233	2 00	214
2.....	2 30	44	3 70	68	3 20	66	①	.....	2 03	225	1 95	197
3.....	2 35	44	3 78	73	3 20	64	4 43	1,504	2 02	222	1 90	180
4.....	2 35	43	3 73	72	3 20	64	3 85	1,134	2 02	222	1 84	162
5.....	2 20	39	3 70	72	3 20	63	3 75	1,074	2 08	244	1 80	150
6.....	2 00	34	3 70	74	3 00	56	3 25	790	2 05	233	1 75	136
7.....	2 00	33	3 70	75	3 00	54	3 05	684	2 00	214	1 75	136
8.....	2 00	33	3 70	76	3 00	54	3 00	658	2 00	214	1 74	133
9.....	1 60	24	3 60	73	2 95	52	3 00	658	2 00	214	1 70	122
10.....	1 40	19	3 60	74	2 95	52	3 00	658	2 10	252	1 65	110
11.....	1 00	12	3 60	76	2 95	52	3 00	658	2 15	272	1 63	105
12.....	2 70	40	3 60	76	2 95	52	2 90	608	2 05	233	1 59	96
13.....	2 70	38	3 60	76	3 20	59	① 2 74	529	1 97	204	1 58	94
14.....	3 40	53	3 60	78	3 30	62	① 2 58	454	1 95	197	1 58	94
15.....	3 40	52	3 60	78	3 30	62	① 2 42	384	1 92	187	1 60	98
16.....	3 10	44	3 60	78	3 30	62	2 26	316	1 92	187	1 63	105
17.....	3 10	42	3 70	86	3 20	59	2 20	292	1 93	190	1 62	103
18.....	3 10	40	3 70	86	3 10	56	2 19	288	1 93	190	1 60	98
19.....	3 05	39	3 70	86	3 10	56	2 25	312	1 95	197	1 60	98
20.....	3 01	36	3 70	88	3 10	56	2 23	304	1 94	194	1 55	89
21.....	3 01	36	3 70	88	3 50	70	2 23	304	2 10	252	1 48	77
22.....	3 01	34	3 60	84	3 70	78	2 20	292	3 80	1,104	1 46	73
23.....	3 01	33	3 50	80	4 00	93	2 15	272	3 45	900	1 40	63
24.....	3 00	35	3 50	80	4 60	139	2 10	252	2 94	628	1 33	56
25.....	2 90	35	3 50	80	5 95	436	2 04	229	2 35	354	1 33	56
26.....	2 60	36	3 50	78	5 50	528	2 10	252	2 20	292	1 35	58
27.....	2 90	37	3 48	78	5 40	676	2 10	252	2 20	292	1 35	58
28.....	2 90	38	3 40	74	5 40	852	2 10	252	2 10	252	1 36	59
29.....	2 90	40	3 30	69	①	.....	2 07	241	2 05	233	1 38	61
30.....	2 90	40	.....	.....	.....	.....	2 05	233	2 05	233	1 48	77
31.....	3 20	48	.....	.....	.....	.....	.....	.....	2 00	214	.....	.....

① Gauge out from March 29 to April 3

② Interpolated.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River at Milk River, for 1912.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1.64	108	1.38	61	1.25	48	1.46	73	1.53	85	1.73	.....
2	1.88	174	1.38	61	1.23	47	1.40	63	1.53	85	1.73	.....
3	1.90	180	1.41	65	1.25	48	1.36	59	1.55	89	1.70	.....
4	1.90	180	1.50	80	1.25	48	1.41	65	1.63	105	1.70	.....
5	1.74	133	1.54	87	1.30	53	1.50	80	1.57	93	1.70	.....
6	1.63	105	1.58	94	1.40	63	1.45	72	1.59	96	1.70	.....
7	1.76	139	1.54	87	1.42	66	1.40	63	1.60	98	1.78	.....
8	1.70	122	1.47	75	1.45	72	1.43	68	1.60	98	1.78	.....
9	1.68	117	1.45	72	1.49	78	1.47	75	1.53	85	1.78	.....
10	2.00	214	1.45	72	1.42	66	1.55	89	1.65	110	1.86	.....
11	1.90	180	1.40	63	1.36	59	1.54	87	1.63	105	1.82	.....
12	1.70	122	1.35	58	1.35	58	1.56	91	1.63	105	1.80	.....
13	1.63	105	1.33	56	1.28	51	1.62	103	1.75	136	1.80	.....
14	1.73	130	1.30	53	1.28	51	1.58	94	1.80	150	1.83	.....
15	1.62	103	1.30	53	1.25	48	1.56	91	1.73	130	1.85	.....
16	1.62	103	1.32	55	1.25	48	1.54	87	1.65	110	1.88	.....
17	1.60	98	1.32	55	1.26	49	1.53	85	1.65	110	1.87	.....
18	1.55	89	1.32	55	1.26	49	1.50	80	1.65	110	1.87	.....
19	1.50	80	1.36	59	1.32	55	1.52	84	1.77	142	1.85	.....
20	1.53	85	1.42	66	1.33	56	1.52	84	.....	.....	1.90	.....
21	1.60	98	1.42	66	1.42	66	1.50	80	1.37	60	1.88	.....
22	1.85	165	1.37	60	1.46	73	1.50	80	1.47	75	1.85	.....
23	2.00	214	1.35	58	1.46	91	1.48	77	1.50	80	1.83	.....
24	1.82	156	1.35	58	1.56	91	1.50	80	1.60	98	1.83	.....
25	1.77	142	1.28	51	1.55	89	1.50	80	1.63	105	1.84	.....
26	1.72	128	1.25	48	1.53	85	1.50	80	1.60	①	1.88	.....
27	1.69	120	1.25	48	1.52	84	1.50	80	1.60	.....	1.85	.....
28	1.60	98	1.25	48	1.53	85	1.55	89	1.86	.....	1.90	.....
29	1.52	84	1.25	48	1.53	85	1.55	89	1.76	.....	2.00	.....
30	1.45	72	1.25	48	1.50	80	1.55	89	1.75	.....	2.00	.....
31	1.37	60	1.25	48	.....	.....	1.60	98	.....	.....	1.90	.....

① Not sufficient data to compute discharges during the frozen period.

## MONTHLY DISCHARGE of Milk River at Milk River, for 1912.

(Drainage area 1,077 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	53	12	37.7	0.035	0.04	2,318
February	88	66	77.3	0.072	0.08	4,446
March	852	52	144	0.134	0.14	79,974
April	1,504	229	496	0.460	0.48	27,546
May	1,104	187	293	0.272	0.31	18,016
June	214	56	105	0.097	0.11	6,248
July	214	60	126	0.117	0.13	7,747
August	94	48	61.6	0.057	0.07	3,788
September	91	47	64.7	0.060	0.07	3,850
October	103	59	81.1	0.075	0.09	4,987
The period	.....	.....	.....	.....	.....	158,920

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## MILK RIVER AT WRITING-ON-STONE POLICE DETACHMENT.

This station was established on August 2, 1909, by F. H. Peters. It is located at Writing-on-Stone R. N. W. M. P. detachment, in the S.W.  $\frac{1}{4}$  Sec. 35, Tp. 1, Rge. 13, W. 4th Mer. It is 17 miles by trail from Coutts and 25 miles from Milk River station.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the right bank. The zero (elev. 86.13) is referred to a permanent iron bench mark (assumed elev. 100.00), located on the right bank directly under the cable and one foot north of the tower.

The river flows in one channel at all stages. It is straight for 300 feet above and 250 feet below the station. Both banks are slightly wooded, high and not liable to overflow except in extreme flood stages of the stream. The bed of the stream is composed of sand which is constantly shifting.

Discharge measurements are made during high water by means of a cable car, tagged wire and stay wire, and at low stages by wading. The initial point for soundings is 50 feet south of a post on the right bank, marked " + 50."

During 1912, the gauge was read by Constable A. P. White.

## DISCHARGE MEASUREMENTS of Milk River at Writing-on-Stone, Police Detachment, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 25.....	J. E. Degnan.....	1.25	145.05	1.86	2.65	269.46
May 7.....	do.....	①.....	.....	.....	2.54	226.58
April 19.....	do.....	①.....	.....	.....	2.45	200.21
April 30.....	do.....	①.....	.....	.....	2.57	221.57
June 10.....	do.....	①.....	.....	.....	2.12	129.77
June 21.....	do.....	①.....	.....	.....	1.97	94.41
June 27.....	do.....	①.....	.....	.....	1.75	64.16
July 3.....	do.....	①.....	.....	.....	2.16	141.87
July 17.....	do.....	①.....	.....	.....	2.04	114.65
July 27.....	do.....	①.....	.....	.....	2.25	161.30
Aug. 5.....	do.....	①.....	.....	.....	1.93	83.58
Aug. 12.....	do.....	①.....	.....	.....	1.79	65.38
Aug. 20.....	do.....	①.....	.....	.....	1.88	82.03
Aug. 30.....	do.....	①.....	.....	.....	1.64	45.06
Sept. 12.....	do.....	①.....	.....	.....	1.81	58.80
Sept. 18.....	do.....	①.....	.....	.....	1.72	48.80
Sept. 27.....	do.....	①.....	.....	.....	1.96	84.90
Oct. 9.....	do.....	①.....	.....	.....	2.00	87.00
Oct. 17.....	do.....	①.....	.....	.....	2.00	87.00
Oct. 31.....	do.....	①.....	.....	.....	1.92	67.39
Nov. 9.....	do.....	①.....	.....	.....	1.78	51.10
Nov. 16.....	do.....	①.....	.....	.....	2.07	98.80

① Not taken at regular station.

DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River, near Writing-on-Stone Police Detachment,  
for 1912.

DAY.	May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2 64	261	③.....	.....	1 86	80
2.....	2 55	234	.....	.....	1 94	94
3.....	2 58	243	.....	.....	2 12	131
4.....	2 57	238	.....	.....	2 30	174
5.....	2 59	244	.....	.....	2 28	169
6.....	2 58	240	.....	.....	2 20	150
7.....	2 54	227	.....	.....	2 05	116
8.....	2 50	215	.....	.....	2 08	123
9.....	2 45	200	.....	.....	①.....	.....
10.....	2 59	242	2 12	131	.....	.....
11.....	2 67	267	①2 05	116	.....	.....
12.....	2 64	238	①1 98	101	.....	.....
13.....	2 53	223	①1 92	90	.....	.....
14.....	①2 50	215	1 85	78	2 09	124
15.....	2 48	209	2 10	126	2 10	126
16.....	2 45	200	2 05	116	2 06	118
17.....	2 42	192	2 10	126	2 04	113
18.....	①2 44	197	2 05	116	2 05	116
19.....	2 45	200	2 05	116	1 95	96
20.....	.....	①.....	2 03	111	1 93	92
21.....	.....	.....	1 97	99	2 01	107
22.....	.....	.....	1 93	92	2 00	105
23.....	.....	.....	1 85	78	2 33	182
24.....	.....	.....	1 80	70	2 46	210
25.....	.....	.....	1 78	67	2 30	174
26.....	.....	.....	1 74	60	2 34	184
27.....	.....	.....	1 74	60	2 25	162
28.....	.....	.....	①1 76	64	2 11	128
29.....	.....	.....	①1 78	67	2 05	116
30.....	2 57	221	1 80	70	1 95	96
31.....	.....	.....	.....	.....	1 89	83

① Interpolated.

② No gauge heights read.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River, near Writing-on-Stone Police Detachment, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.85	76	1.63	44	1.96	83	1.68	41
2.....	1.85	75	1.63	43	1.93①	79	1.76	49
3.....	1.84	72	1.62	42	1.90	74	1.92	68
4.....	1.83	70	1.68	48	1.89①	72	2.04	87
5.....	1.95	87	1.75	55	1.87①	69	2.04	87
6.....	1.95	88	1.75	54	1.86	67	2.04	87
7.....	1.96	91	1.75	54	1.84	64	2.03	85
8.....	2.05	109	1.78	57	1.90	72	1.74	47
9.....	1.97	94	1.84①	64	2.00	87	1.78	51
10.....	1.90	82	1.91	74	1.97	82	1.75	50
11.....	1.80	67	1.86	66	1.96	80	2.00	85
12.....	1.84	73	1.82	60	1.97	82	1.96	80
13.....	1.77	63	1.87	67	1.99	85	2.02	90
14.....	1.71	56	1.76	53	2.00	87	2.25	136
15.....	1.70	55	1.73	50	2.02	90	2.25	136
16.....	1.73	59	1.75	52	2.03	92	.....	.....
17.....	1.72	58	1.73	50	2.04	94	.....	.....
18.....	1.73	58	1.73	50	1.96	80	.....	.....
19.....	1.80	69	1.75	53	1.95	78	.....	.....
20.....	1.85	77	1.79	59	1.94	76	.....	.....
21.....	1.88	83	1.80	61	1.94	75	.....	.....
22.....	1.81	72	1.81	63	1.94	75	.....	.....
23.....	1.80	70	1.95	83	1.97	80	.....	.....
24.....	1.75	62	1.95	83	1.97	79	.....	.....
25.....	1.71	56	1.99	90	1.90	68	.....	.....
26.....	1.71	56	2.02	96	1.94	74	.....	.....
27.....	1.67	51	1.96	85	1.94	73	.....	.....
28.....	1.65	48	1.99	90	1.94	72	.....	.....
29.....	1.64	46	1.96	84	1.98	78	.....	.....
30.....	1.62	43	1.97	86	1.99	79	.....	.....
31.....	1.62	43	.....	.....	1.92	67	.....	.....

① Interpolated.

## MONTHLY DISCHARGE of Milk River at Writing-on-Stone Police Detachment, for 1912.

(Drainage area 1,620 square miles).

MONTH	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Total in Acre-feet.
May (1-19).....	267	192	226	0.140	8,965
June (10-30).....	131	60	93	0.057	3,874
July (1-8 and 14-31).....	210	80	130	0.080	6,082
August.....	109	43	68	0.042	0.05
September.....	96	42	63.9	0.039	0.04
October.....	94	64	77.8	0.048	0.06
November (1-15).....	136	41	78.6	0.048	0.03
The period.....	.....	.....	.....	0.40	34,626



## MILK RIVER AT PENDANT D'OREILLE POLICE DETACHMENT.

This station was established by F. H. Peters on August 5, 1909. It is located 300 feet upstream from the buildings of the police post on the S.W.  $\frac{1}{4}$  Sec. 21, Tp. 2, Rge. 8, W. 4th Mer., and is about 61 miles by trail from Milk River station.

The gauge, which is a plain staff graduated to feet and hundredths, is on the left bank, about 80 feet downstream from the cable. The zero (elev. 82.45) is referred to a permanent iron bench mark (assumed elev. 100.00), located directly under the cable, about five feet from the tower on the left bank.

The river flows in one channel, which at ordinary stages is about 150 feet wide. It is straight for about 400 feet above and 300 feet below the station. The right bank is low, covered with small willows, and is liable to overflow at high stages. The left bank is high, almost clear and is not liable to overflow. The bed of the stream is composed of sand and is constantly changing.

Discharge measurements are made during high water by means of a cable car, tagged wire, and stay wire, and at low stages by wading. The initial point for soundings is the face of a cedar post on the left bank.

During 1912, the gauge was read by Corporal Tom R. Brewer.

## DISCHARGE MEASUREMENTS of Milk River at Pendant d'Oreille, Police Detachment, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 28.....	J. E. Degnan.....				3.38	317.71
May 4.....	do.....				3.24	265.38
May 23.....	do.....				4.41	1,075.03
May 24.....	do.....				4.66	1,188.83
May 27.....	do.....				3.575	379.79
June 12.....	do.....				2.84	122.03
June 18.....	do.....				2.78	120.06
June 29.....	do.....				2.51	59.29
July 2.....	do.....				2.70	75.54
July 20.....	do.....				2.76	94.41
July 25.....	do.....				3.14	207.00
Aug. 7.....	do.....				2.62	88.20
Aug. 10.....	do.....				2.66	90.00
Aug. 23.....	do.....				2.66	60.91
Aug. 28.....	do.....				2.58	39.80
Sept. 14.....	do.....				2.66	49.10
Sept. 16.....	do.....				2.64	50.06
Oct. 1.....	do.....				2.79	90.03
Oct. 6.....	do.....				2.69	67.11
Oct. 19.....	do.....				2.82	85.00
Oct. 29.....	do.....				2.82	77.40
Nov. 11.....	do.....				2.80	84.90
Nov. 14.....	do.....				2.79	75.40

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River, at Pendant d'Oreille, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			3.30	286	3.16	214	2.65	72
2.....			3.35	306	3.18	220	2.87	102
3.....			3.24	264	3.15	211	2.92	123
4.....			3.22	257	3.10	195	2.98	137
5.....			3.20	250	3.07	187	2.97	136
6.....			3.32	294	3.05	182	2.99	141
7.....			3.25	268	2.98	164	3.03	151
8.....			3.20	250	2.90	144	3.06	159
9.....			3.12	223	2.90	144	3.07	162
10.....			3.08	210	2.90	144	3.07	162
11.....			3.10	216	2.85	132	3.09	163
12.....			3.11	219	2.84	130	3.09	169
13.....			3.11	219	2.80	121	3.00	146
14.....			3.10	216	2.82	126	2.96	137
15.....			3.10	216	2.88	139	2.89	121
16.....			3.10	216	2.85	132	2.95	136
17.....			3.12	223	2.76	112	2.89	122
18.....			3.14	230	2.78	117	2.80	102
19.....			3.10	216	2.76	112	2.80	103
20.....			3.12	223	2.74 ③	108	2.80	103
21.....			3.20	250	2.71 ③	101	2.76	100
22.....			3.30	286	2.68 ③	95	2.83	121
23.....			4.25 ①	940	2.66 ③	90	2.84	126
24.....			4.69	1,189	2.64 ③	86	3.11	197
25.....			4.02	637	2.61 ③	79	2.99	166
26.....			3.79	492	2.58 ③	73	3.02	176
27.....			3.56	372	2.56 ③	68	3.01	175
28.....	3.38	318	3.41	304	2.54 ③	64	2.96	164
29.....	3.40	326	3.39	296	2.51	57	2.86	141
30.....	3.41	330	3.37	289	2.57	64	2.74	114
31.....			3.31	266			2.70	106

① No gauge heights read before April 28.

② Water rising. Discharge interpolated.

③ Gauge height interpolated.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River, at Pendant d'Oreille Police Detachment, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.76	120	2.56	35	2.80	92	2.86	89
2.....	2.79	127	2.56	35	2.73	81	2.88	93
3.....	2.75	118	2.58	38	2.73	76	2.87	92
4.....	2.73	113	2.66	53	2.73	76	2.87	94
5.....	2.71	109	2.74	69	2.70	70	2.88	96
6.....	2.70	106	2.73	66	2.69	67	2.90	101
7.....	2.62	88	2.65	50	2.69	66	2.88	98
8.....	2.68 <sup>⑤</sup>	99	2.72	63	2.71	70	3.00	125
9.....	2.73	107	2.76	71	2.75	78	2.90	104
10.....	2.70	99	2.75	68	2.82	92	2.85 <sup>⑤</sup>	94
11.....	2.72	100	2.74	66	2.86	100	2.80	85
12.....	2.59	70	2.74	66	2.88	103	2.81	84
13.....	2.51	52	2.66	49	2.92	111	2.84	84
14.....	2.49	46	2.66	49	2.86	97	2.80	78
15.....	2.51	48	2.67	53	2.85	94	2.95	110
16.....	2.52	48	2.64	50	2.85	94	2.96	111
17.....	2.54	50	2.65	53	2.82	87	.....	.....
18.....	2.57	54	2.62	47	2.77	75	.....	.....
19.....	2.64	66	2.62	48	2.82	77	.....	.....
20.....	2.65	66	2.60	45	2.76	72	.....	.....
21.....	2.72	78	2.65	55	2.76	71	.....	.....
22.....	2.67 <sup>⑤</sup>	65	2.69	64	2.79	77	.....	.....
23.....	2.62	53	2.75	77	2.82	82	.....	.....
24.....	2.60	48	2.81	90	2.81	79	.....	.....
25.....	2.67	61	2.81	91	2.80	76	.....	.....
26.....	2.62	50	2.82	93	2.82	80	.....	.....
27.....	2.58	41	2.82	94	2.79	73	.....	.....
28.....	2.58	40	2.80	90	2.86 <sup>⑤</sup>	74	.....	.....
29.....	2.60	43	2.80	91	2.82	77	.....	.....
30.....	2.59	41	2.79	89	2.85	85	.....	.....
31.....	2.57	37	.....	.....	2.86	88	.....	.....

⑤ Gauge height interpolated.

## MONTHLY DISCHARGE of Milk River at Pendant d'Oreille Police Detachment, for 1912.

(Drainage area 2,175 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (28-30).....	330	318	325	0.149	0.02	1,934
May.....	1,189	210	326	0.150	0.17	20,045
June.....	220	57	127	0.059	0.07	7,557
July.....	197	72	136	0.062	0.07	8,362
August.....	127	37	72.4	0.33	0.04	4,452
September.....	94	35	63.6	0.029	0.03	3,784
October.....	111	66	81.9	0.038	0.04	5,036
November (1-16).....	125	78	96.1	0.044	0.03	3,050
The period.....	.....	.....	.....	.....	0.47	54,220

## MILK RIVER AT SPENCER'S LOWER RANCH.

This station was established on August 7, 1909, by F. H. Peters. It is located on the S.E.  $\frac{1}{4}$  Sec. 3, Tp. 1, Rge. 5, W. 4th Mer., about 1,000 feet upstream from the International boundary. It is 90 miles by trail from Milk River station, 26 miles from Pendant d'Oreille police detachment and 19 miles from Wild Horse police detachment.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post on the right bank, about 450 feet below the cable. The zero (elev. 85.32) is referred to a permanent

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iron bench mark (assumed elev. 100.00), located on the left bank, 450 feet below the cable and directly opposite the gauge.

The river flows in one channel at all stages. It is straight for about 300 feet above and 500 feet below the station. The right bank is low, wooded and liable to overflow during extreme flood stages. The bed is composed of sand which is constantly shifting.

Discharge measurements are made during high water by means of a cable car, tagged wire, and stay wire, and at low stages by wading. The initial point for soundings is the inner face of a round post on the left bank.

During 1912, the gauge was read by Charles Lattimer.

## DISCHARGE MEASUREMENTS of Milk River at Spencer's Lower Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 30	J. E. Degnan	117 0	155 85	1.91	3.04	297 60
May 24	do	128 0	244 30	4.38	4.04	1,068.82
May 25	do	125 0	207 25	3.72	3.78	770.96
June 14	do	106 0	91.40	1.30	2.27	118.52
June 30	do	103 0	56 65	1.07	2.07	60.46
July 21	do	84 0	66.30	1.40	2.31	93.00
Aug. 8	do	65 0	55.50	1.34	2.14	74.20
Aug. 24	do	64 0	48 00	1.11	1.98	53.20
Sept. 15	do	65 0	47 00	1.10	2.00	51.60
Oct. 2	do	33.5	51.00	1.48	2.18	75.80 ①
Oct. 25	do	34 0	53.20	1.26	2.20	67.40 ①

① Measurement made below regular station.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River, at Spencer's Lower Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	①		3.00	280	3.00	319	2.09	64
2			2.90	241	2.93	290	2.16	73
3			2.94	257	2.82	249	2.17	74
4			2.84	221	2.75	226	2.28	85
5			2.85	224	2.64	194	2.36	101
6	4.63	2,008	2.85	224	2.60	183	2.52	133
7	4.26	1,382	2.90	241	2.53	165	2.50	128
8	3.98	994	2.94	257	2.51	162	2.49	126
9	3.75	744	2.90	241	2.45	147	2.46	120
10	3.72	717	2.86	228	2.42	143	2.43	114
11	3.58	602	2.93	253	2.36	132	2.41	110
12	3.75	744	2.90	241	2.34	130	2.42	112
13	4.10	1,150	2.94	257	2.30	123	2.42	112
14	3.61	625	3.03	293	2.27	118	2.67	171
15	3.62	633	2.93	253	2.34	132	2.56	142
16	3.44	504	2.85	224	2.47	161	2.41	110
17	3.25	395	2.82	215	2.38	138	2.38	105
18	3.14	341	2.75	194	2.28	115	2.43	114
19	3.00	280	2.73	188	2.27	113	2.37	103
20	3.00	280	2.74	191	2.25	107	2.35	100
21	3.02	288	2.74	191	2.20	95	2.33	96
22	3.04	297	2.75	194	2.20	93	2.30	91
23	3.05	301	2.84	221	2.15	84	2.30	91
24	3.10	322	3.91	909	2.10	76	2.28	88
25	3.10	322	3.80	791 ②	2.05	68	2.47	122
26	3.12	333	3.56	618	2.05	66	2.69	176
27	3.14	341	3.53	608	2.05	64	2.53	135
28	3.08	314	3.46	567	2.05	62	2.52	133
29	3.04	297	3.15	382	2.05	60	2.48	124
30	3.04	297	3.09	356	2.05	59 ②	2.44	116
31			3.01	322			2.34	98

① No gauge heights before April 6.

② Shifting conditions from May 25 to June 30.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Milk River, at Spencer's Lower Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.28	88	1.84	38	2.17	74	2.19	77
2.....	2.27	87	1.80	35	2.17	74	2.19	77
3.....	2.26	86	1.82	37	2.18	75	2.19	77
4.....	2.35	100	1.94	47	2.17	74	2.19	77
5.....	2.18	75	2.06	60	2.16	73	2.19	77
6.....	2.12	68	2.00	53	2.15	72	2.21	79
7.....	2.07	61	2.03	57	2.15	72	2.23	82
8.....	2.14	70	2.24	83	2.16	73	2.24	83
9.....	2.04	58	2.20	78	2.17	74	2.24	83
10.....	2.13	69	2.17	74	2.10	65	2.20	78
11.....	2.15	72	2.13	69	2.12	68	2.15	72
12.....	2.07	61	2.09	64	2.17	74	2.16	73
13.....	2.05	59	2.07	61	2.27	87	2.17	74
14.....	2.04	58	2.05	59	2.14	70	2.16	73
15.....	2.00	53	2.03	57	2.14	70	2.15	72
16.....	1.95	48	2.00	53	2.24	83	2.15	72
17.....	1.96	49	1.90	43	2.26	86		
18.....	1.96	49	1.96	49	2.29	90		
19.....	2.00	53	1.96	49	2.29	90		
20.....	2.00	53	1.94	47	2.27	87		
21.....	2.03	57	1.98	51	2.26	86		
22.....	2.00	53	2.00	53	2.23	82		
23.....	2.05	59	2.07	61	2.25	84		
24.....	2.03	57	2.15	72	2.25	84		
25.....	1.94	47	2.15	72	2.25	84		
26.....	1.92	45	2.19	77	2.23	82		
27.....	1.91	44	2.19	77	2.21	79		
28.....	1.90	43	2.22	81	2.20	78		
29.....	1.93	46	2.19	77	2.20	78		
30.....	1.86	40	2.20	78	2.19	77		
31.....	1.85	39			2.19	77		

## MONTHLY DISCHARGE of Milk River at Spencer's Lower Ranch, for 1912.

(Drainage area 2,448 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (6-30).....	2,008	280	580	0.237	0.22	28,782
May.....	900	191	318	0.130	0.15	19,583
June.....	319	59	136	0.056	0.06	8,093
July.....	176	64	113	0.046	0.05	6,948
August.....	100	39	59.6	0.024	0.03	3,665
September.....	83	35	60.4	0.024	0.03	3,594
October.....	90	65	78.1	0.032	0.04	4,802
November (1-16).....	83	72	76.6	0.031	0.02	2,432
The period.....					0.60	77,869

STUDY OF CONDITIONS OF RUN-OFF IN WATERSHED OF MILK RIVER from its headwaters to its eastern crossing from Canada.  
 Sec. 3, Tp. 1, Rgc. 5, W. of 4 Mer.

STATION.	AREA OF WATERSHED IN SQUARE MILES.					RUN-OFF IN AC. FT.		RUN-OFF PER SQ. MILE IN AC. FT.
	Additional to last Station.		Total for Station.			Additional to last Station.	Total for Station.	
	Canada.	U. S. A.	Total.	Canada.	U. S. A.			
For Period Aug. 1 to Oct. 31, 1911.								
Peter's Ranche (N.Br.) 13-1-23-4.....				18	91	109	8,743	80.21
Mackie's Ranch (S. Br.).....				51	390	441	16,260	36.87
Milk River.....	519	8	527	588	489	1,077	27,919	25.92
Writing-on-Stone.....	414	129	543	1,002	618	1,620	28,661	17.69
Pendant d'Oreille.....	397	158	555	1,399	776	2,175	42,400	19.52
Spencer's Lower Ranch.....	246	27	273	1,645	803	2,448	44,542	18.20
For Period Aug. 1 to Oct. 31, 1912:—								
Peter's Ranche (N. Br.).....				18	91	109	4,475	41.05
Mackie's Ranche (S. Br.).....				51	390	441	6,760	15.33
Milk River.....	519	8	527	588	489	1,077	12,625	11.72
Writing-on-Stone.....	414	129	543	1,002	618	1,620	12,767	7.89
Pendant d'Oreille.....	397	158	555	1,399	776	2,175	13,272	6.10
Spencer's Lower Ranch.....	246	27	273	1,645	803	2,448	12,061	4.93

## DEER CREEK AT DICKENSON'S RANCH.

This station was established May 26, 1911, by J. E. Degnan. It is 22 miles by trail from Courtts and is located on the S.W.  $\frac{1}{4}$  Sec. 15, Tp. 1, Rge. 12, W. 4th Mer., about 300 feet above the dam and intake of Dickenson Bros.' irrigation ditch and about  $\frac{1}{4}$  mile above their ranch buildings.

The gauge, which is a plain staff graduated to feet and hundredths, is located at the right bank. The zero (elev. 90.72) is referred to the top of a post at the final point for soundings on the right bank (assumed elev. 100.00).

The stream flows in one channel and is straight for about 30 feet above and 100 feet below the station. The right bank is composed of a sandy loam, covered with rose bushes, and is liable to overflow. The left bank is high and liable to overflow. The bed of the stream is composed of gravel and sand and is about 40 feet wide. In ordinary stages the stream averages from six feet to ten feet wide and runs along the right side of the bed. It is liable to great change in high water but apparently remains constant in low water.

Discharge measurements are made by wading. The initial point for soundings is the face of a stake driven in the left bank and marked "I.P."

No gauge height observations were obtained during 1912 as it was not possible to secure an observer.

## DISCHARGE MEASUREMENTS of Deer Creek at Dickenson's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 26	J. E. Degnan	7 6	3 80	0 76	1 33	2 88
May 6	do	7 6	4 03	0 56	1 26	2 27
May 20	do	6 8	3 58	0 45	1 22	1 61
May 29	do	6 8	3 83	0 68	1 27	2 63
June 10	do	6 3	2 52	0 16	1 11	0 39
June 20	do			①	1 11	0 70
June 28	do	2 9	0 95	0 55	1 06	0 52
July 3	do			①	1 11	0 63
July 18	do	6 2	2 78	0 33	1 16	0 92
July 26	do	6 6	3 30	0 52	1 22	1 70
Aug. 6	do	6 6	3 21	0 56	1 22	1 74
Aug. 12	do	6 3	3 09	0 36	1 18	1 10
Aug. 21	do	5 9	2 72	0 30	1 15	0 80
Aug. 29	do	6 0	2 76	0 24	1 13	0 66
Sept. 13	do	5 8	2 53	0 24	1 12	0 62
Sept. 28	do	6 0	3 07	0 40	1 18	1 24
Oct. 8	do	6 3	3 30	0 43	1 20	1 41
Oct. 18	do	7 8	4 90	1 49	1 49	7 29
Oct. 30	do	7 0	3 80	1 09	1 39	4 13
Nov. 10	do	6 3	2 83	0 56	1 24	1 58
Nov. 15	do	5 5	1 93	0 13	1 07	0 26

① Weir measurement.

## DEER CREEK CATTLE COMPANY IRRIGATION DITCH.

This station was established on April 27, 1912, by J. E. Degnan. It is located on the S.W.  $\frac{1}{4}$  Sec. 36, Tp. 1, Rge. 12, W. 4th Mer. It is 200 feet below the dam and intake of the ditch.

The gauge, which is a plain staff graduated to feet and hundredths, is located on the left bank. The zero (elev. 93.49) is referred to a permanent bench mark (assumed elev. 100.00), located on a stone on the northwest corner of the barn foundation, about 100 feet east of the gauge.

The original bed of the stream is composed of clay, but a great amount of sand has washed in from the creek, causing a continual change in the cross-section. The banks are not liable to overflow, the surplus water finding its way through the two spillways at the dam.

Discharge measurements are made by wading. The initial point for sounding is a spike driven in the downstream brace post of the gauge.

During 1912, the gauge was read by F. W. Webster.

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## DISCHARGE MEASUREMENTS of Deer Creek Cattle Company Irrigation Ditch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 27.....	J. E. Degnan.....	6.0	2.03	1.40	2.88	2.85
May 6.....	do.....	5.9	2.03	0.87	2.82	1.77
May 22.....	do.....	7.0	2.15	0.90	3.14	1.94
May 29.....	do.....	6.5	2.23	1.21	2.97	2.70
June 11.....	do.....	2.0	0.43	1.02	2.70	0.44
June 28.....	do.....				Dry.	Nil.
July 3.....	do.....				Dry.	Nil.
July 18.....	do.....	15" Weir.			2.27	0.309
July 26.....	do.....	4.7	0.87	0.92	2.34	0.80
Aug. 6.....	do.....	3.0	0.70	1.08	2.31	0.76
Aug. 28.....	do.....	15" Weir.			2.16	0.0847
Oct. 7.....	do.....	3.0	0.67	1.10	2.25	0.74
Oct. 18.....	do.....	6.0	3.28	2.18	2.66	7.16
Oct. 29.....	do.....	4.0	1.10	1.58	2.30	1.74
Nov. 14.....	do.....	1.6	0.26	0.73	2.09	0.19

## DAILY GAUGE-HEIGHT AND DISCHARGE of Deer Creek Cattle Company Irrigation Ditch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.75	19.25	2.82	1.82	2.86①	1.40	Dry.	Nil.
2.....	2.60	11.75	2.82	1.82	2.86①	1.56	"	"
3.....	2.50	7.50	2.80	1.46	2.85	1.57	"	"
4.....	2.47	6.45	2.80	1.46	2.80	1.02	"	"
5.....	2.45	5.75	2.80	1.46	2.80	1.14	"	"
6.....	2.45	5.75	2.80	1.46	2.80	1.22	"	"
7.....	2.43	5.05	2.79	1.06	2.75	0.72	"	"
8.....	2.43	5.05	2.78	0.75	2.74	0.66	2.45	2.28
9.....	2.42	4.70	2.86	1.50	2.75	.80	2.35	0.90
10.....	2.30	1.00	2.86	1.22	2.74	.74	2.30	0.46
11.....	2.28	.80	2.87	1.10	2.70	.44	2.27	.31
12.....	2.27	.70	2.85	0.68	2.67	.31	2.25	.24
13.....	2.27	.70	2.80	0.29	2.65	.23	2.40	1.55
14.....	2.50	7.50	2.76	.14	2.70	.44	2.37	1.15
15.....	2.45	5.75	2.90	.62	2.85	2.27	2.30	.46
16.....	2.33	1.90	2.90	.48	2.75	0.83	2.38	1.30
17.....	2.33	1.90	2.95	.70	2.73	.64	2.30	0.46
18.....	2.33	1.90	3.00	1.02	2.69	.39	2.27	.31
19.....	2.33	1.90	3.03	1.14	2.69	.39	2.32	.69
20.....	2.33	1.90	3.05	1.16	Dry.	Nil.	2.32	.69
21.....	2.32	1.60	3.17	2.80	"	"	2.32	.69
22.....	2.32	1.60	3.15	2.10	"	"	2.28	.40
23.....	2.33	1.90	3.00	.60	"	"	2.48	2.78
24.....	2.34	2.20	2.97	.60	"	"	2.35	1.02
25.....	2.36①	2.80	2.94	.60	"	"	2.35	1.02
26.....	2.38	3.40	3.05	2.52	"	"	2.33	.72
27.....	2.88	2.89	3.00	2.16	"	"	2.30	.50
28.....	2.84	2.18	2.95	1.82	"	"	2.30	.51
29.....	2.84	2.18	2.93	1.99	"	"	2.25	.28
30.....	2.84	2.18	2.90①	1.70	"	"	2.25	.28
31.....			2.87	1.40			2.23	.22

① Gauge height interpolated.



DAILY GAUGE-HEIGHT AND DISCHARGE of Deer Creek Cattle Company Irrigation Ditch, for 1912.  
Concluded.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.52	4.30			2.18	0.23	2.20	0.83
2.....	2.35	1.10			2.23	.59	2.20	0.83
3.....	2.40	1.88			2.20	.28	2.23	1.10
4.....	2.35	1.14			2.27	1.00		③
5.....	2.32	0.83				⑤		
6.....	2.28	.51						③
7.....	2.25	.36			2.25	0.80	2.10	0.22
8.....	2.23	.29		⑤			2.10	.22
9.....	2.23	.30	2.15	0.17			2.13	0.40
10.....	2.23	.31	2.13	0.12				③
11.....	2.20	.22	2.12	.10				
12.....	2.18	.17	2.09	.04				
13.....	2.15	.12	2.11	.07				③
14.....	2.14	.11	2.14	.14			2.09	0.19
15.....	2.16	.14	2.15	.17			2.05	.11
16.....	2.25	.48	2.14	.14			2.04	.09
17.....	2.24	.42	2.14	.14			2.03	.07
18.....	2.23	.38	2.10	0.05	2.66	7.16	2.02	.04
19.....	2.26	.55	2.30	1.31			2.01	.02
20.....	2.20①	.23	2.25②	0.80			2.01	.02
21.....	2.15	.13	2.20	0.28			2.02	.04
22.....	2.10	.08	2.27	1.00			2.02	.04
23.....	2.13①	.10	2.38	2.31			2.03	0.07
24.....	2.16①	.13	2.28	1.10				
25.....	2.19①	.18	2.25	0.80				
26.....	2.22	.22	2.25①	.80				
27.....	2.15	.09	2.25	.80				
28.....	2.15	.08	2.24①	.69		⑤		
29.....	2.20	.28	2.24	.69	2.30	1.74		
30.....	2.15	0.17	2.20	0.28	2.19	0.77		
31.....	③				2.20	0.83		

① Gauge height interpolated.

② During the periods, August 31 to September 8; October 5 to October 28; November 4 to 6; and Nov. 10 to 13 the observer was absent.

## MONTHLY DISCHARGE of Deer Creek Cattle Co. Irrigation Ditch, for 1912.

(Drainage area 16① square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	19.25	0.70	4.00	0.25	0.28	238
May.....	2.80	0.14	1.28	0.08	0.09	79
June.....	2.27	Nil.	0.559	0.035	0.04	33
July.....	2.78	Nil.	0.62	0.039	0.04	38
①August.....	4.30	0.08	0.51	0.032	0.037	30
②September.....	2.31	0.04	0.54	0.034	0.038	32
③October.....	7.16	0.23	1.49	0.093	0.107	92
④November (1-23).....	1.10	0.02	0.27	0.016	0.014	12
The period.....					0.646	554

①The entire flow of Deer Creek is diverted into the ditch and therefore the drainage area of the creek is used.

②During the period records were not taken regularly but the mean obtained was taken as the mean for the period and the results shown obtained in that manner.

## SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Milk River drainage basin, in 1912.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. Feet.</i>	<i> Ft. per Sec.</i>	<i>Sec.-ft.</i>
April 27	J. E. Degnan	Bear Gulch Creek	Sec. 19-2-9-4	8.5	5.23	1.49	7.80
May 28	do	do	do	8.0	3.90	0.92	3.59
June 28	do	do	do				Nil.
July 18	do	do	do				"
" 25	do	do	do				"
April 27	do	Dead Horse Coulee	Sec. 4-2-11-4	2.5	1.11	0.80	0.93
May 5	do	do	do	5.0	2.10	.40	0.85
" 22	do	do	do	4.5	2.35	.25	0.58
" 28	do	do	do	2.3	0.46	0.30	0.14
June 11	do	do	do				Nil.
" 28	do	do	do				"
July 18	do	do	do				"
" 25	do	do	do				"
April 27	do	Halfbreed Creek	Sec. 21-2-10-4	9.6	10.51	0.97	10.20
May 5	do	do	do	9.4	10.31	0.86	8.91
" 28	do	do	do	9.8	11.07	1.01	11.18
June 11	do	do	do	①			0.12
" 19	do	do	do	①			0.67
" 28	do	do	do				Nil.
July 16	do	do	do				"
" 25	do	do	do				"
Nov. 14	do	do	do	4.6	1.36	1.10	1.49
May 1	do	Kennedy Creek	Sec. 3-1-5-4				Nil.
June 30	do	do	do				"
July 21	do	do	do				"
Aug. 8	do	do	do				"
April 27	do	Miners Coulee	Sec. 10-2-11-4	8.0	3.27	1.37	4.47
May 5	do	do	do	5.7	2.88	1.18	3.40
" 22	do	do	do	7.00	2.20	0.75	1.63
" 28	do	do	do	8.0	2.75	0.94	2.59
June 11	do	do	do	①			102
" 28	do	do	do				Nil.
July 18	do	do	do				"
" 25	do	do	do				"
Nov. 14	do	do	do				0.99
April 26	do	Police Coulee	Sec. 35-1-13-4	5.6	2.44	1.16	2.82
May 7	do	do	do	5.2	2.07	0.89	1.86
" 19	do	do	do	4.6	1.34	0.75	1.01
June 10	do	do	do	4.3	0.74	0.58	.43
July 3	do	do	do				Nil.
Aug. 5	do	do	do				"
May 30	L. J. Gleason	Spring	Sec. 13-1-23-4	2.1	0.84	0.94	0.78
May 8	do	Spring Creek	Sec. 24-1-23-4	2.5	1.25	0.72	0.90
May 17	J. E. Degnan	Red River	Sec. 18-1-15-4				Nil.
June 1	do	do	do				"
Aug. 2	do	do	do				"
May 7	do	Verdigris Coulee	Sec. 29-2-14-4				"
" 30	do	do	do				"

NOTE.—*Width* is the actual width of water surface, not including piers. *Area of section* is the total area of the measured section, including both moving and still water.

① Weir measurement.

## PAKOWKI LAKE DRAINAGE BASIN.

*General Description.*

The drainage into Pakowki Lake comes from three different directions; from the west by way of Etzikom Coulee, from the southeast through Canal and Ketchun Creeks, and from the northeast through Manyberries Creek. The lake has no outlet. The streams within this drainage basin are very similar in their general characteristics, all having narrow, deep and well defined valleys, with sparse growths of brush along the bottoms, and all draining a sandy and very unproductive appearing soil. The drainage consists almost entirely of the spring run-off, the soil being so devoid of moisture as to take care of an ordinary rainfall without allowing any drainage into the streams, except during periods of exceptional rainfall.

Very little information has as yet been collected regarding the flow in any of the above mentioned streams, and the only one touched upon as yet being Manyberries Creek. No high water measurements have been taken, and owing to the nature of the channel it is practically impossible to estimate the spring run-off.

Messrs. Hooper and Huckvale have constructed very efficient irrigation works, and divert water from Manyberries Creek, to irrigate 2,120 acres of hay meadow. The yield of hay has been very much increased by the use of the water.

## MANYBERRIES CREEK AT HOOPER AND HUCKVALE'S RANCH.

This station was established May 2, 1912, by J. E. Degnan. It is located on the S.W.  $\frac{1}{4}$  Sec. 27, Tp. 4, Rge. 6, W. 4th Mer., about three hundred yards south of Messrs. Hooper and Huckvale's ranch buildings and one quarter mile downstream from the dam and intake of their irrigation ditch.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post driven in the bed of the stream, and securely stayed to the right bank. The zero of the gauge (elev. 87.00) is referred to a permanent iron bench mark (assumed elev. 100.00), sunk in the bed of the stream at the right bank about fifty feet north of the gauge.

The channel is straight for about one hundred feet upstream and fifty feet downstream from the station. The left bank is high and will not overflow. The right bank is low, covered with brush, and is liable to overflow in extreme high water. The bed of the stream is composed of sand and gravel, and shifts at high stages.

Discharge measurements are made by wading. The initial point for soundings is a post driven in the right bank.

During 1912, the gauge was read by Sidney Hooper.

## DISCHARGE MEASUREMENTS of Manyberries Creek, at Hooper and Huckvale's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 2 ..	J. E. Degnan .....	5.3	2.03	0.54	2.14	1.10
June 16...	do .....	17.0	17.25	1.41	3.45	24.29
July 23...	do .....				1.85	0.00 ①
Aug. 26...	do .....					Nil.
Oct. 5....	do .....					Nil.

① Point of zero flow.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Manyberries Creek, at Hooper and Huckvale's Ranch, for 1912.

DAY.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			2.05	0.70
2	2.14	1.14	1.95	0.30
3	2.05	0.70	1.95	0.30
4	1.97	0.38	1.95	0.30
5	1.97	0.38	1.95	0.30
6	2.03	0.62	1.93	0.22
7	2.05	0.70	1.93	0.22
8	2.30	2.20	1.92	0.18
9	2.30	2.20	1.92	0.18
10	2.27	1.99	1.92	0.18
11	2.25	1.85	1.92	0.18
12	2.25	1.85	1.92	0.18
13	2.20	1.50	1.95	0.30
14	2.20	1.50	1.95	0.30
15	2.15	1.20	1.98	0.42
16	2.13	1.08	3.20	16.30
17	2.13	1.08	2.31	2.29
18	2.13	1.08	1.95	0.30
19	2.12	1.02	1.95	0.30
20	2.11	0.96	1.93	0.22
21	2.11	0.96	1.93	0.22
22	2.11	0.96	1.89	0.10
23	2.11	0.96	1.86	0.03
24	2.11	0.96	1.86	0.03
25	2.10	0.90	1.86	0.03
26	1.95	0.30	1.85	0.00
27	3.15	15.05	1.85	0.00
28	3.94	①48.48	1.85	0.00
29	2.74	7.10	1.86	0.03
30	2.30	2.20	1.87	0.04
31	2.60	5.20		

① Discharge estimated.

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## MONTHLY DISCHARGE of Manyberries Creek at Hooper and Huckvale's Ranch, for 1912.

(Drainage area 139 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May (2-31) . . . . .	62.28	0.65	6.14	0.044	0.05	365
June . . . . .	23.40	0.00	1.64	0.012	0.01	98
The period . . . . .					0.06	463

NOTE.—The above discharge and run-off includes the water diverted by Hooper's irrigation ditch above this station.

## HOOPER AND HUCKVALE IRRIGATION DITCH.

This station was established May 2, 1912, by J. E. Degnan. It is located on the S.W.  $\frac{1}{4}$  Sec. 27, Tp. 4, Rge. 6, W. 4th Mer., about 100 yards north of Messrs. Hooper and Huckvale's ranch buildings and 700 feet downstream from the dam and intake of the ditch.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post driven in the bed of the stream and securely stayed to the right bank. The zero of the gauge (elev. 93.35) is referred to a permanent iron bench mark (assumed elev. 100.00) on the northwest corner of the foundation of the ranch house.

The channel is straight for about 50 feet above and 30 feet below the station. The bed of the stream is composed of clay, and is not liable to shift.

Discharge measurements are made by wading. The initial point for soundings is a post driven in the right bank.

During 1912, the gauge was read by Sidney Hooper.

## DISCHARGE MEASUREMENTS of Hooper and Huckvale Ditch at Hooper's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 2 . . . . .	J. E. Degnan . . . . .	10.2	9.96	0.60	2.34	6.85
June 16 . . . . .	do . . . . .	11.2	13.12	0.99	2.635	12.97
June 16 . . . . .	do . . . . .	7.5	5.35	0.14	1.81	0.77
Aug. 26 . . . . .	do . . . . .					Nil.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Hooper and Huckvale Ditch, at Hooper's Ranch, for 1912

DAY.	May.		June.		July.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2 34	6.9	2 05	2.90	1.53	Nil
2.	2 25	5.5	1 95	1.94	1.54	"
3.	2 25	5.5	1 86	1 17	①	
4.	2 23	5.2	1 82	0.86		
5.	2 23	5.2	1 75	0.35		
6.	2 25	5.5	1 71	0.07		
7.	2 25	5.5	1 70	0.00		
8.	①		1.66	Nil.		
9.			1.65	"		
10.			1.64	"		
11.				"		
12.				"		
13.				"		
14.			1 70			
15.			1.77	0.40		
16.			2 23	5.20		
17.			2 35	7.10		
18.			2 09	3.40		
19.			1 88	1.20		
20.			1.75	0.35		
21.			1.66	Nil		
22.			1.61	"		
23.			1.58	"		
24.			1.56	"		
25.	②		1.55	"		
26.	1 75	.35	1.53	"		
27.	2 38	7.60	1.52	"		
28.	2 67	13.80	1.53	"		
29.	2 53	10.60	1.53	"		
30.	2 29	6.00	1.52	"		
31.	2 25	5.50				

① Gate closed.

② Gate opened.

## MONTHLY DISCHARGE of Hooper and Huckvale Ditch at Hooper's Ranch, for 1912.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May.....	13.80	0 00	2.59			154
June.....	7.10	0.00	0.834			50
The period.....						204

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MISCELLANEOUS DISCHARGE MEASUREMENTS made in Pakowki Lake drainage basin, in 1912.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. feet.	Ft. per Sec.	Sec.-ft.
May 3.....	J. E. Degnan....	Canal Creek.....	Sec. 6-4-6-4.....				NIL.
June 17.....	do .....	do .....	do .....	6.0	2.60	0.23	0 59
July 27.....	do .....	do .....	do .....				NIL.
Aug. 27.....	do .....	do .....	do .....				NIL.
May 3.....	do .....	Ketchum Creek....	Sec. 16-4-6-4.....				NIL.
June 17.....	do .....	do .....	do .....	8.5	8.60	0.47	4 02
July 24.....	do .....	do .....	do .....				NIL.
Aug. 27.....	do .....	do .....	do .....				NIL.

NOTE.—Width is the actual width of water surface, not including piers. Area of section is the total area of the measured section, including both moving and still water.

SAGE CREEK DRAINAGE BASIN.

*General Description.*

Sage Creek is a small and unimportant stream which rises in township 5, range 4, west of the 4th meridian, and flows southerly, crossing the international boundary in range 2.

The stream has no definite or permanent source of supply, and derives its discharge principally from the melting of snow which accumulates in numerous coulees during the winter months. The period of flow, therefore, is in general confined to the spring months while the melting snow is passing off. Very heavy rains sometimes cause a flow, but the drainage area being absolutely devoid of tree growth, the run-off is very rapid.

After entering the United States Sage Creek spreads out over a large dry lake which has no outlet. This lake is about ten miles long and averages one and a half miles in width, and lies close to the boundary. The lake is bounded on the south by a low range of hills and at some time has held two or three feet of water at its deepest parts. Since 1908 there has been no water in the lake.

SAGE CREEK AT WILD HORSE POLICE DETACHMENT.

This station was established on August 10, 1909, by F. H. Peters. It is located in Sec. 9, Tp. 1, Rge. 2, W. 4th Mer., about one and a quarter miles from Wild Horse police post. It is about 115 miles by trail from Milk River P. O.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post in the centre of the channel. The zero of the gauge (elev. 93.36) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the right bank.

The channel is straight for 40 feet above and below the station. The banks are composed of hard clay, and are high, but liable to overflow. The bed is composed of hard gumbo clay.

Discharge measurements are made with a meter by wading. The initial point for soundings is the face of a post on the right bank marked "I.P." in red paint.

During 1912, the gauge was read by George Sherwood. Two visits were made by the district hydrographer in 1912, in May and October, but as there was no flow in either instance no estimate of the discharge has been made.

LODGE CREEK DRAINAGE BASIN.

*General Description.*

Lodge Creek, which rises in Township 7, Range 3, West of the Fourth Meridian, flows in a southerly direction for about 12 miles, then turns southeastward, crosses the international boundary in Section 4, Township 1, Range 28, West of the Third Meridian, and eventually empties into Milk River near Chinook, Montana. Its principal tributary is Middle Creek, which joins it in section 4, Township 2, Range 29, West of the Third Meridian.

Near its head the valley is very deep and narrow but it broadens out considerably lower down, giving rise to large flats and meadows. The upper part of the drainage basin is cut up to a great extent by deep coulees which drain into the creek. This part of the creek is thickly covered with brush along the banks, but lower down it is totally devoid of tree growth. The valley is rather unproductive, owing to the absence of moisture, but a few good hay meadows have been developed along its course through the storage of the flood waters and their application to the soil by irrigation. As is the case with many of the streams in this locality the flow in Lodge Creek

is not continuous throughout the year, the creek being dry, with the exception of pools of standing water, during the greater part of the summer months. At flood stages the creek carries a considerable amount of water and as a result its channel is wide and well defined throughout the whole length of its course.

Three stations have been established on the main stream: at Willow Creek Police detachment near the international boundary, at Hartt's Ranch near the head of the creek and about midway between these last two at Hester's ranch near the fourth meridian. Descriptions of these stations are given below.

The loss from floods in this drainage basin was confined to irrigation works. The value of the works destroyed was about \$3,000, the schemes affected being practically all situated on Middle Creek.

#### EAST BRANCH OF LODGE CREEK AT ENGLISH'S RANCH.

This station was established on October 7, 1911, by M. H. French. It is located at James English's ranch in the S.E.  $\frac{1}{4}$  Sec. 1, Tp. 7, Rge. 3, W. 4th Mer., about 150 feet north of his house. It is five miles above the junction with the main creek and about 45 miles by trail from Medicine Hat.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post sunk in the bed of the stream near the right bank. The zero of the gauge (elev. 95.35) is referred to a permanent iron bench mark (assumed elev. 100.00) located on the left bank four feet from the initial point for soundings and in line with the regular cross section.

The channel is straight for about 50 feet above and 25 feet below the station. Both banks are wooded and high enough to contain the stream during all stages. The bed is composed of very coarse gravel and will not shift.

Discharge measurements are made with a meter by wading a short distance above the gauge. The initial point for soundings is a four inch stake, one foot above ground on the left bank.

During 1912, the gauge was read by Mrs. Annie English.

Water is diverted from this stream at a point about three miles above this station, by James English. During the irrigating season almost the total flow is diverted.

#### DISCHARGE MEASUREMENTS of East Branch Lodge Creek, near English's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 20.....	G. R. Elliott.....	12.5	5.12	0.70	1.14	3.56
June 25.....	do .....	10.0	1.52	0.03	0.75	0.05
July 27.....	do .....					Nil ①
Oct 1.....	do .....					Nil ①
Nov. 1.....	do .....	11.0	2.47	0.06	0.84	0.15

①Water standing in pools.

②Creek dry.

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DAILY GAUGE-HEIGHT AND DISCHARGE of East Branch Lodge Creek, at English's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1 30	7.65	1 20	4 90	0 70	0 02
2.....			1 33	8 49	1 18	4 36	0 70	0 02
3.....			1 29	7 37	1 15	3 55	0 70	0 02
4.....			1 28	7 09	1 13	3 07	0 70	0 02
5.....	2 62	73.18	1 40	10.55	1 12	2 83	0 70	0 02
6.....	2 32	54 70	1 50	14.00	1 10	2 35	0 70	0 02
7.....	2 32	54 70	1 53	15 20	1 08	2 01	0 70	0 02
8.....	2 70	78.30	1 50	15 20	1 06	1 67	0 70	0 02
9.....	2 62	73.18	1 45	12 20	1 04	1 39	0 70	0 02
10.....	2 70	78.30	1 40	10.55	1 01	1 03	0 70	0 02
11.....	2 20	47 60	1 33	8 49	0 95	0 58	0 70	0 02
12.....	1 85	29 00	1 30	7 65	0 93	0 49	0 65	Nil.
13.....	1 60	18 00	1 25	6 25	0 91	0 39	0 65	"
14.....	1 49	13 64	1 20	4 90	1 00	0 92	0 65	"
15.....	1 45	12 20	1 20	4 90	0 93	0 49	0 65	"
16.....	1 48	13.28	1 20	4 90	0 92	0 44	0 65	"
17.....	1 50	14.00	1 18	4 36	0 90	0 35	0 65	"
18.....	1 39	10.25	1 16	3 82	0 90	0 35	Dry.	"
19.....	1 54	15.60	1 14	3 31	0 85	0 20	"	"
20.....	1 40	10.55	1 11	2 59	0 83	0 16	"	"
21.....	1 39	10.25	1 12	2 83	0 81	0 12	"	"
22.....	1 40	10.55	1 13	3 07	0 78	0 08	"	"
23.....	1 40	10.55	1 13	3 07	0 75	0 05	"	"
24.....	1 39	10.25	1 12	2 83	0 72	0 03	"	"
25.....	1 40	10.55	1 13	3 07	0 70	0 02	"	"
26.....	1 37	9.65	1 13	3 07	0 70	0 02	"	"
27.....	1 34	8.77	3 22	112.00	0 70	0 02	"	"
28.....	1 36	9.35	1 88	30.50	0 72	0 03	"	"
29.....	1 40	10 55	1 38	9 95	0 72	0 03	"	"
30.....	1 33	8.49	1 34	8 77	0 70	0 02	"	"
31.....			1 30	7 65			"	"



## DAILY GAUGE-HEIGHT AND DISCHARGE of East Branch Lodge Creek, at English's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	Dry.	Nil.	Dry.	Nil.	Dry.	Nil.	0 90	①
2.....	"	"	"	"	"	"	0 90	.....
3.....	"	"	"	"	"	"	0 92	.....
4.....	"	"	"	"	"	"	0 93	.....
5.....	"	"	"	"	"	"	0 94	.....
6.....	"	"	"	"	"	"	0 94	.....
7.....	"	"	"	"	"	"	0 95	.....
8.....	"	"	"	"	"	"	0 95	.....
9.....	"	"	"	"	"	"	0 96	.....
10.....	"	"	"	"	"	"	0 96	.....
11.....	"	"	"	"	"	"	0 96	.....
12.....	"	"	"	"	"	"	0 97	.....
13.....	"	"	"	"	"	"	0 96	.....
14.....	"	"	"	"	0 75	0 05	0 96	.....
15.....	"	"	"	"	0 75	0 05	0 96	.....
16.....	"	"	"	"	0 75	0 05	.....	.....
17.....	"	"	"	"	0 76	0 06	.....	.....
18.....	"	"	"	"	0 76	0 06	.....	.....
19.....	"	"	"	"	0 77	0 07	.....	.....
20.....	"	"	"	"	0 77	0 07	.....	.....
21.....	"	"	"	"	0 78	0 08	.....	.....
22.....	"	"	"	"	0 78	0 08	.....	.....
23.....	"	"	"	"	0 78	0 08	.....	.....
24.....	"	"	"	"	0 78	0 08	.....	.....
25.....	"	"	"	"	0 78	0 08	.....	.....
26.....	"	"	"	"	0 78	0 08	.....	.....
27.....	"	"	"	"	0 79	0 09	.....	.....
28.....	"	"	"	"	0 79	0 09	.....	.....
29.....	"	"	"	"	0 80	0 10	.....	.....
30.....	"	"	"	"	0 82	0 14	.....	.....
31.....	"	"	"	"	0 85	0 20	.....	.....

① Ice conditions Nov. 1 to 15. Not sufficient data to compute daily discharge accurately.

## MONTHLY DISCHARGE of East Branch of Lodge Creek at English's Ranch, for 1912.

(Drainage area 15 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (5-30).....	78.30	8.49	26.75	1.78	1.72	1,382.
May.....	112.00	2.59	11.18	0.74	0.85	688.
June.....	4.92	0.02	1.06	0.07	0.078	65.
July.....	0.02	0.02	0.71	.0004	0.0005	0.
August.....	.....	.....	.....	.....	.....	Nil.
September.....	.....	.....	.....	.....	.....	Nil.
October.....	0.20	0.05	0.049	0.0055	0.0045	3.
The period.....	.....	.....	.....	.....	2.65	2,138

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ANDERSON DITCH NEAR THELMA.

This station was established on September 23, 1911, by W. A. Fletcher. It is located on the S.W.  $\frac{1}{4}$  Sec. 23, Tp. 6, Rge. 3, W. 4th Mer., about fifteen feet below the intake of the ditch, and about one quarter of a mile from Robert Anderson's house.

The gauge, which is a plain staff graduated to feet and inches, is fixed to a post on the left bank of the ditch. The zero of the gauge (elev. 98.63) is referred to the top of a stake (assumed elev. 100.00), about five feet southeast of the gauge.

The channel is straight for twenty feet above and thirty feet below the gauge. Both banks are low but are not liable to overflow. The bed is composed of clay and gravel and is not liable to shift.

Discharge measurements are made by wading near the gauge. The initial point for soundings is the inner face of the post used as a bench mark.

No water was diverted during 1912.

LODGE CREEK AT HARTT'S RANCH.

This station was established July 22, 1909, by F. T. Fletcher. It was originally located just north of the road allowance between Secs. 10 and 15, Tp. 6, Rge. 3, W. 4th Mer., but was moved on June 22, 1912, by G. R. Elliott, about 800 feet downstream to the N.W.  $\frac{1}{4}$  Sec. 9, Tp. 6, Rge. 3, W. 4th Mer., about one mile below the junction of the east branch. It is about 45 miles by trail south of Medicine Hat.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a support on the upstream side of the wooden bridge near Mr. Hartt's house. The zero of the gauge (elev. 83.26) is referred to a permanent iron bench mark (assumed elev. 100.00), which is located at the permanent section on the left bank 4.91 feet south of the initial point for soundings and in line with the section.

The channel is straight for about 200 feet above and 50 feet below the station. The banks are high, steep and not liable to overflow. Both are covered with a dense growth of willow brush. The bed of the stream is composed of soft clay and there is one channel at all stages. At periods of no flow, water stands at a depth of as much as two feet at the gauge.

Discharge measurements are made during high water with a meter at the gauge. At ordinary stages measurements are made with meter by wading, 840 feet upstream. The initial point for soundings is the face of a four inch post mark "I.P." located on the left bank, 300 feet north and 215 feet west of the gauge.

During 1912, the gauge was read by Mrs. Ed. Hartt.

DISCHARGE MEASUREMENTS of Lodge Creek, at Hartt's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 20.....	G. R. Elliott.....	10.0	12.20	0.42	1.35	5.50
June 22.....	do .....	8.5	3.48	0.06	0.45	0.22
July 26.....	do .....					Nil ①
Aug. 27.....	do .....					Nil ①
Oct. 1.....	do .....					Nil ①
Nov. 2.....	do .....					Nil ①

① Water standing in pools.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Lodge Creek, at Hartt's Ranch, for 1912.

DAY.	April		May		June		July	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3.00	①	2.87	20.30	1.83	9.27	2.27	0.06
2	4.00		2.82	19.48	1.62	7.46	2.26	0.04
3	12.00		2.43	15.13	1.46	6.22	2.25	0.02
4	15.00	①	2.37	14.50	1.31	5.17	2.25	0.02
5	11.00	1195.00	2.31	13.90	1.22	4.54	2.24	Nil ①
6	6.57	323.00	3.52	50.74	1.07	3.49	2.24	"
7	8.17	565.00	3.41	44.18	1.04	3.28	2.23	"
8	8.92	713.00	2.91	21.18	1.02	3.14	2.23	"
9	8.91	710.00	2.12	12.00	0.97	2.79	2.22	"
10	8.07	550.0	2.07	11.50	0.89	2.24		"
11	5.97	256.00	2.02	11.00	0.82	1.82		"
12	4.07	88.00	1.95	10.35	0.73	1.30		"
13	3.57	53.88	1.82	9.18	0.72	1.25		"
14	3.82	71.08	1.80	9.00	0.52	0.46		"
15	4.07	88.00	1.77	8.73	1.02	3.14		"
16	4.17	97.00	1.74	8.46	1.26	4.82		"
17	3.87	74.82	1.71	8.19	0.97	2.79		"
18	3.75	66.00	1.57	7.06	0.90	2.30		"
19	3.57	53.88	1.47	6.29	0.83	1.88		"
20	3.37	41.92	1.41	5.87	0.64	0.86		"
21	3.62	57.12	1.37	5.59	0.57	0.61		"
22	3.87	74.82	1.33	5.31	② 2.36	0.22		"
23	3.72	63.90	1.30	5.10	2.35	0.20		"
24	3.54	51.98	1.32	5.24	2.34	0.18		"
25	3.11	28.76	1.32	5.24	2.33	0.16		"
26	3.02	24.90	1.27	4.89	2.36	0.22		"
27	2.81	19.34	5.47	205.00	2.30	0.10		"
28	2.87	20.30	5.02	165.00	2.28	0.08		"
29	2.93	21.74	2.97	23.02	2.28	0.08		"
30	2.90	20.90	2.17	12.50	2.27	0.06		"
31			2.17	12.50				"

No flow from July 5 to end of year.

① Ice conditions April 1 to 4.

② Gauge rod moved to new position. Discharges June 22 to July 5. Estimated from old rod.

③ Water standing in pools.

## MONTHLY DISCHARGE of Lodge Creek at Hartt's Ranch, for 1912.

(Drainage area 78 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (5th to 30th).....	1195.00	19.34	205.01	2.63	2.55	10,572
May.....	205.00	4.89	24.39	0.31	0.36	1,500
June.....	9.27	9.27	0.06	0.03	0.03	139
July.....	0.06	0.00	0.004			0.3
August.....						Nil. ①
September.....						Nil. ①
October.....						Nil. ①
November (1st to 15th).....						Nil. ①
The period.....					2.94	12,211

NOTE.—① Water standing in pools.

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LODGE CREEK AT HESTER'S RANCH.

This station was established August 31, 1912, by G. R. Elliott. It is located on the N.E.  $\frac{1}{4}$  Sec. 36, Tp. 3, Rge. 1, W. 4th Mer., and is about seventeen miles by trail west from Govenlock Post Office, Sask.

The gauge, which is a plain staff, graduated to feet and hundredths, is fixed to a heavy post, sunk in the bed of the stream on the right bank and strongly braced. The zero of the gauge (elev. 87.22) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the right bank.

The channel is straight for 100 feet above and 30 feet below the station. The banks are high, brush covered, and are not liable to overflow. The bed is composed of clean gravel.

Discharge measurements are usually made with a meter by wading, but at low stages a weir is used. The initial point for soundings is the face of a five inch post on the right marked "I.P." in knife cuts, which is 280 feet south and 120 feet east of the quarter mound north of Sec. 36, Tp. 3, Rge. 1, W. 4th Mer.

After the station was established there was no flow in 1912.

MIDDLE CREEK AT MCKINNON'S RANCH.

This station was established June 21, 1910, by H. R. Carscallen. It is located on the S.W.  $\frac{1}{4}$  Sec. 35, Tp. 5, Rge. 1, W. 4th Mer., about 11 miles southwest of Battle Creek Post Office.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to a braced post sunk in the bed of the stream on the left bank. The zero of the gauge (elev. 91.57) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the left bank about five feet from the edge, on the line of the cross section and 664 feet northeast of the N.E. cor. Sec. 27, Tp. 5, Rge. 1, W. 4th Mer.

The channel is almost straight for about 150 feet above and 100 feet below the station. The right bank is high with a gradual slope; the left bank is high and steep. Neither bank is liable to overflow except in extreme flood. The bed of the stream is composed of sand and coarse gravel.

At ordinary stages, discharge measurements are made with a weir, and at high stages with a current meter by wading.

During 1912, the gauge was read by Angus McKinnon.

Springs just above this station keep the creek flowing all summer, although a few miles below it is dry a large portion of the season.

DISCHARGE MEASUREMENTS of Middle Creek, at McKinnon's Ranch, in 1912.

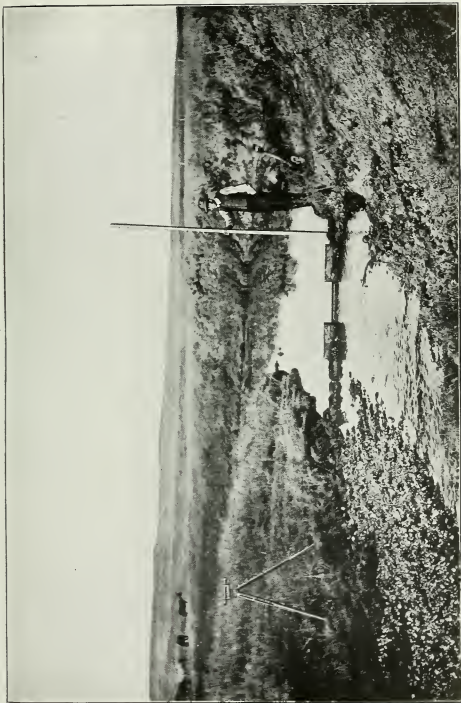
Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 1.....	M. H. French.....	17.5	28.26	0.91	2.45	25.80
May 31.....	G. R. Elliott.....	14.5	13.30	0.35	1.30	4.66
July 10.....	do .....	13.5	5.28	0.16	0.73	0.86
July 31.....	do .....	13.0	4.60	0.09	0.56	0.43
Sept. 10.....	do .....	13.0	3.95	0.12	0.62	0.49 <sup>Ⓢ</sup>
Oct. 3.....	do .....	13.0	3.86	0.15	0.60	0.58
Oct. 3.....	do .....	13.0	3.86	0.16	0.60	0.61
Nov. 4.....	do .....	12.5	3.61	0.17	0.56	0.61 <sup>Ⓢ</sup>

Ⓢ Changing conditions. Aug. 1 to Nov. 15.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Middle Creek, at McKinnon's Ranch, for 1912.

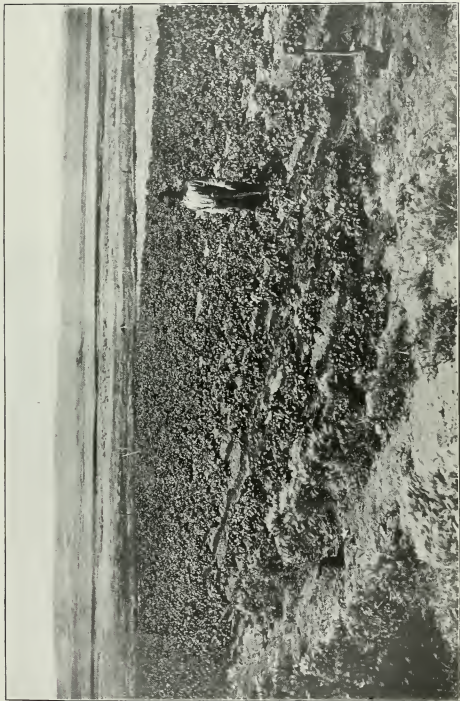
DAY.	May.		June.		July.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.45	25.80	1.06	2.72	①0.70	0.68
2.....	①2.44	25.52	①1.00	2.30	0.72	0.77
3.....	①2.43	25.24	0.98	2.18	①0.72	0.77
4.....	2.42	24.96	0.98	2.18	①0.72	0.77
5.....	2.38	23.87	①0.95	2.00	0.72	0.77
6.....	2.38	23.87	0.93	1.88	①0.72	0.77
7.....	①2.37	23.60	0.93	1.88	0.72	0.77
8.....	①2.37	23.60	0.88	1.60	①0.72	0.77
9.....	2.36	23.34	0.83	1.33	0.72	0.77
10.....	①2.30	21.75	0.83	1.33	0.72	0.77
11.....	①2.20	19.30	0.73	0.82	①0.72	0.77
12.....	2.09	16.89	0.72	0.77	0.71	0.73
13.....	①1.90	13.00	0.70	0.68	0.71	0.73
14.....	①1.70	9.70	0.70	0.68	0.71	0.73
15.....	1.58	7.99	0.83	1.33	①0.71	0.73
16.....	1.28	4.52	0.76	0.97	0.71	0.73
17.....	①1.25	4.25	0.73	0.82	0.71	0.73
18.....	①1.20	3.80	0.73	0.82	0.71	0.73
19.....	1.18	3.64	①0.73	0.82	①0.71	0.73
20.....	1.18	3.64	①0.73	0.82	0.71	0.73
21.....	①1.15	3.40	0.73	0.82	0.75	0.92
22.....	①1.10	3.00	①0.73	0.82	0.72	0.77
23.....	1.08	2.86	0.73	0.82	0.71	0.73
24.....	①1.06	2.72	①0.73	0.82	0.71	0.73
25.....	①1.05	2.65	①0.73	0.82	0.71	0.73
26.....	1.03	2.51	0.73	0.82	0.70	0.68
27.....	1.03	2.51	0.72	0.77	0.70	0.68
28.....	①1.00	2.30	0.72	0.77	0.66	0.43
29.....	0.95	2.00	0.72	0.77	0.65	0.41
30.....	①0.95	2.00	0.78	1.07	0.64	0.40
31.....	1.30	4.70			0.66	0.43

①Gauge-height interpolated.



Gauging Middle Creek at McKinnon's Ranch with a twenty-four inch weir. Taken by G. R. Elliott.





Angus McKinnon's irrigated Garden. Taken by G. R. Elliott.





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DAILY GAUGE-HEIGHT AND DISCHARGE of Middle Creek, at McKinnon's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.65	⑤0.41	0.63	0.49	0.62	0.59	0.56	0.61
2.....	0.67	0.47	0.63	0.49	0.62	0.60	0.55	0.61
3.....	0.66	0.43	0.64	0.51	0.60	0.58	0.55	0.61
4.....	0.65	0.41	0.65	0.53	0.60	0.58	0.54	0.61
5.....	0.65	0.41	0.64	0.51	0.60	0.58	0.54	0.61
6.....	0.65	0.41	0.64	0.51	0.60	0.58	0.53	0.61
7.....	0.65	0.41	0.64	0.51	0.59	0.58	0.53	0.61
8.....	0.65	0.41	0.65	0.53	0.59	0.58	0.53	0.61
9.....	0.63	0.40	0.61	0.47	0.58	0.58	0.53	0.61
10.....	0.62	0.40	0.62	0.49	0.58	0.58	0.53	0.61
11.....	0.62	0.40	0.61	0.49	0.57	0.58	0.53	0.61
12.....	0.62	0.40	0.61	0.49	0.57	0.58	0.53	0.61
13.....	0.62	0.40	0.61	0.50	0.57	0.58	0.52	0.61
14.....	0.62	0.40	0.61	0.50	0.57	0.58	0.52	0.61
15.....	0.65	0.50	0.61	0.50	0.57	0.58	0.52	⑤0.61
16.....	0.63	0.45	0.61	0.51	0.57	0.59	.....	.....
17.....	0.62	0.45	0.61	0.51	0.57	0.59	.....	.....
18.....	0.62	0.45	0.61	0.52	0.57	0.59	.....	.....
19.....	0.63	0.48	0.61	0.52	0.57	0.59	.....	.....
20.....	0.62	0.47	0.61	0.53	0.56	0.59	.....	.....
21.....	0.62	0.47	0.62	0.55	0.56	0.59	.....	.....
22.....	0.62	0.47	0.62	0.55	0.56	0.59	.....	.....
23.....	0.62	0.47	0.62	0.55	0.57	0.60	.....	.....
24.....	0.62	0.47	0.62	0.56	0.57	0.60	.....	.....
25.....	0.62	0.47	0.62	0.56	0.56	0.60	.....	.....
26.....	0.63	0.49	0.62	0.57	0.56	0.60	.....	.....
27.....	0.64	0.51	0.62	0.57	0.56	0.60	.....	.....
28.....	0.63	0.49	0.62	0.58	0.56	0.60	.....	.....
29.....	0.65	0.53	0.62	0.59	0.56	0.60	.....	.....
30.....	0.65	0.53	0.62	0.59	0.57	0.63	.....	.....
31.....	0.64	0.51	.....	.....	0.57	0.63	.....	.....

⑤ Changing conditions Aug. 1 to Nov. 15.

MONTHLY DISCHARGE of Middle Creek at McKinnon's Ranch, for 1912.

(Drainage area 123 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May.....	25.80	2.00	11.58	0.094	0.11	712
June.....	2.72	0.68	1.21	0.010	0.01	72
July.....	0.92	0.40	0.70	0.0057	0.006	43
August.....	0.53	0.40	0.45	0.0036	0.004	28⑤
September.....	0.59	0.47	0.53	0.0043	0.005	32
October.....	0.63	0.58	0.59	0.0048	0.006	36
November (1-15).....	0.61	0.61	0.61	0.0049	0.003	18⑤
The period.....	.....	.....	.....	.....	0.14	941

⑤ Changing conditions Aug. 1 to Nov. 15.

MIDDLE CREEK AT ROSS' RANCH.

This station was established July 20, 1908, by H. R. Carscallen. It is located on the S.W. ¼ Sec. 30, Tp. 5, Rge. 29, W. 3rd Mer., about four miles southwest of Battle Creek Post Office.

The gauge, which is a plain staff, graduated to feet and hundredths, is nailed to a post sunk in the bed of the stream at the right bank and securely stayed. The zero of the gauge (elev. 93.58) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the right bank.

The channel is straight for 50 feet above and below the station. The right bank is high but the left is low and liable to overflow in flood stages of the stream. The bed of the stream is composed of sand and coarse gravel with a little vegetation at the station, and may shift slightly during high water. There is only one channel at low stages but in extreme flood stages, water breaks out over the left bank and forms two channels. The current is sluggish at low stages and moderate at higher stages.

Discharge measurements are made with a weir at ordinary summer stages and with a current meter by wading at high stages. The initial point for soundings is a square stake driven into the left bank and marked "I.P."

During 1912, the gauge was read by Maurice Ross.

The stream would be dry most of the summer at this station if it were not for the discharge of a few springs a short distance above. A part of the run-off of the drainage basin above this station is held back by dams at Wright's and McKinnon's ranches and used for irrigation purposes.

#### DISCHARGE MEASUREMENTS of Middle Creek, at Ross' Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 11.....	M. H. French.....	148.0	238.00	3.030	5.46	721.30
April 30.....	do.....	12.0	12.10	1.640	1.28	19.82
May 31.....	G. R. Elliott.....	9.7	11.30	1.290	1.19	14.56
July 10.....	do.....	9.0	4.60	0.054	0.56	0.25
July 30.....	do.....	9.0	4.60	0.054	0.56	0.25
Nov. 4.....	do.....	9.0	5.42	0.042	0.53	0.23

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Middle Creek, at Ross' Ranch, for 1912.

DAY.	April		May		June		July	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	0.60	①	1.23	15.47	1.05	9.35	0.56	0.30
2.....	1.70	.....	1.28	17.42	0.78	2.83	0.56	0.30
3.....	2.68	.....	1.28	17.42	0.70	1.58	0.58	0.40
4.....	3.30	①	1.22	15.08	0.64	0.89	0.56	0.30
5.....	6.85	1,685	1.09	10.50	0.56	0.30	0.56	0.30
6.....	6.26	1,190	0.99	7.52	0.56	0.30	0.57	0.35
7.....	6.06	1,056	0.95	6.40	0.56	0.30	0.56	0.30
8.....	6.06	1,056	0.96	6.68	0.56	0.30	0.58	0.40
9.....	5.81	900	0.96	6.68	0.56	0.30	0.57	0.35
10.....	5.56	770	1.01	8.42	0.56	0.30	0.56	0.30
11.....	5.40	695	1.05	9.35	0.56	0.30	0.56	0.30
12.....	5.06	560	0.96	6.68	0.56	0.30	0.56	0.30
13.....	4.08	280	0.92	5.68	0.56	0.30	0.56	0.30
14.....	2.93	104	0.90	5.20	0.56	0.30	0.56	0.30
15.....	2.30	58	0.89	4.98	0.66	1.10	0.56	0.30
16.....	1.96	45.09	0.77	2.65	0.64	0.89	0.56	0.30
17.....	1.96	45.09	0.77	2.65	0.62	0.69	0.57	0.30
18.....	2.16	52.00	0.73	2.01	0.56	0.30	0.57	0.35
19.....	2.08	48.00	0.72	1.87	0.56	0.30	0.57	0.35
20.....	1.94	44.26	0.71	1.72	0.56	0.30	0.57	0.35
21.....	1.86	40.96	0.70	1.58	0.56	0.30	0.57	0.35
22.....	1.82	39.32	0.69	1.46	0.56	0.30	0.57	0.35
23.....	1.78	37.68	0.68	1.34	0.56	0.30	0.56	0.30
24.....	1.64	31.94	0.68	1.34	0.56	0.30	0.56	0.30
25.....	1.53	27.46	0.65	0.98	0.56	0.30	0.56	0.30
26.....	1.45	24.22	0.65	0.98	0.56	0.30	0.56	0.30
27.....	1.40	22.20	0.65	0.98	0.56	0.30	0.56	0.30
28.....	1.24	15.86	0.64	0.89	0.56	0.30	0.56	0.30
29.....	1.20	14.30	0.64	0.89	0.56	0.30	0.56	0.30
30.....	1.32	19.00	0.62	0.69	0.56	0.30	0.56	0.30
31.....			0.97	6.96			0.56	0.30

① Ice conditions April 1 to 4.

SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Middle Creek, at Ross' Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.56	0.30	0.59	0.45	0.58	0.40	0.54	0.24
2.....	0.57	0.35	0.59	0.45	0.58	0.40	0.54	0.24
3.....	0.59	0.45	0.59	0.45	0.58	0.40	0.54	0.24
4.....	0.59	0.45	0.60	0.50	0.58	0.40	0.53	0.23
5.....	0.58	0.40	0.60	0.50	0.58	0.40	0.53	0.23
6.....	0.58	0.40	0.60	0.50	0.59	0.40	0.53	0.23
7.....	0.57	0.35	0.60	0.50	0.58	0.40	0.53	0.23
8.....	0.57	0.35	0.60	0.50	0.58	0.40	0.53	0.23
9.....	0.57	0.35	0.60	0.50	0.58	0.40	0.52	0.22
10.....	0.57	0.35	0.59	0.45	0.58	0.40	0.52	0.22
11.....	0.57	0.35	0.59	0.45	0.58	0.40	0.52	0.22
12.....	0.57	0.35	0.59	0.45	0.58	0.40	0.52	0.22
13.....	0.56	0.30	0.59	0.45	0.58	0.40	0.52	0.22
14.....	0.56	0.30	0.59	0.45	0.58	0.40	0.52	0.22
15.....	0.56	0.30	0.59	0.45	0.59	0.40	0.52	0.22
16.....	0.56	0.30	0.59	0.45	0.58	0.40		
17.....	0.56	0.30	0.59	0.45	0.58	0.40		
18.....	0.56	0.30	0.58	0.40	0.58	0.40		
19.....	0.58	0.40	0.58	0.40	0.58	0.40		
20.....	0.58	0.40	0.58	0.40	0.58	0.40		
21.....	0.58	0.40	0.58	0.40	0.58	0.40		
22.....	0.58	0.40	0.58	0.40	0.58	0.40		
23.....	0.58	0.40	0.58	0.40	0.57	0.35		
24.....	0.58	0.40	0.58	0.40	0.57	0.35		
25.....	0.58	0.40	0.59	0.45	0.57	0.35		
26.....	0.59	0.45	0.58	0.40	0.57	0.35		
27.....	0.59	0.45	0.58	0.40	0.57	0.35		
28.....	0.59	0.45	0.58	0.40	0.57	0.35		
29.....	0.59	0.45	0.58	0.40	0.56	0.30		
30.....	0.59	0.45	0.58	0.40	0.56	0.30		
31.....	0.60	0.50			0.55	0.25		

MONTHLY DISCHARGE of Middle Creek at Ross' Ranch, for 1912.

(Drainage area 173 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (5-30).....	1.688	14.30	340.94	1.97	1.91	17,582
May.....	17.42	0.69	5.56	0.032	0.037	342
June.....	9.35	0.30	0.81	0.0047	0.005	48
July.....	0.40	0.30	0.32	0.0018	0.002	20
August.....	0.50	0.30	0.38	0.0022	0.002	23
September.....	0.50	0.40	0.44	0.0025	0.003	26
October.....	0.40	0.25	0.38	0.0022	0.002	23
November (1-15).....	0.24	0.22	0.23	0.0013	0.002	7
The period.....					1.96	18,071

MIDDLE CREEK AT HAMMOND'S RANCH.

This station was established June 13, 1910, by H. R. Carscallen. It is located at Hammond's ranch, on the N.W.  $\frac{1}{4}$  Sec. 4, Tp. 2, Rge. 29, W. 3rd Mer., about seven miles above the Willow Creek police detachment and about one quarter of a mile above the junction of Middle and Lodge Creeks.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to a post sunk in the bed of the creek near the left bank. An auxiliary gauge, reading from ten to fourteen feet, is located near the top of the left slope opposite the main gauge. The zero of the gauge

(elev. 87.51) is referred to a permanent iron bench mark (assumed elev. 100.00) on the left bank. The "B.M." is about six inches above ground and is protected by a mound of stones. It is also used as the initial point for soundings.

The channel is straight for 200 feet above and 125 feet below the station. Both banks are high and fairly steep, free from brush and not liable to overflow. The bed of the stream is sandy and may shift at high stages. The station, being located only a short distance above the junction with Lodge Creek, may be affected by backwater from that creek during high water stages.

Discharge measurements are made at the station by wading, and at extreme low stages a weir may be used. High water measurements are not attainable as there is no structure at or near the station to support the engineer in taking the gaugings when the water becomes too deep for wading. The initial point for soundings is the permanent bench mark.

During 1912, the gauge was read by Mrs. D. A. Hammond.

#### DISCHARGE MEASUREMENTS of Middle Creek, at Hammond's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 15.....	M. H. French.....	27.5	98.60	1.19	4.43	117.08
May 25.....	G. R. Elliott.....	20.0	18.00	0.15	1.72	2.69
June 27.....	do.....				1.45	Nil ①
Aug. 6.....	do.....					Nil ②
Aug. 31.....	do.....					Nil ②
Oct. 12.....	do.....				1.01	Nil ②
Nov. 8.....	do.....				0.95	Nil ②

① Too small to measure.

② Water standing in pools.

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Middle Creek, at Hammond's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.05	①	2.75	26.50	1.76	3.24	1.40	0.05
2.....	3.55		2.70	24.85	1.75	3.10	1.40	0.05
3.....	4.08		2.65	23.25	1.73	2.84	1.39	0.04
4.....	4.48	①	2.63	22.61	1.70	2.45	1.37	0.03
5.....	12.00 ① 884		2.60	21.65	1.68	2.21	1.36	0.03
6.....	11.40	799	2.55	20.40	1.65	1.85	1.35	0.02
7.....	11.30	784	2.55	20.10	1.64	1.74	1.34	0.02
8.....	11.10	757	2.55	20.10	1.62	1.52	1.33	0.01
9.....	11.00	744	2.50	18.55	1.60	1.30	1.32	0.01
10.....	11.00 ① 744		2.50	18.55	1.59	1.21	1.31	0.00
11.....	10.98	741	2.45	17.05	1.57	1.03	1.31	0.00
12.....	9.00 ① 500		2.40	15.65	1.55	0.85	1.30	0.00
13.....	7.00	299	2.35	14.35	1.53	0.69	1.29	0.00
14.....	5.00 ① 144		2.30	13.15	1.55	0.85	1.28	0.00
15.....	4.43	117	2.25	12.05	2.00	7.10	1.27	0.00
16.....	3.90	79.70	2.20	11.00	2.40	15.65	1.26	0.00
17.....	3.90	79.70	2.15	10.00	2.34	14.11	1.24	0.00
18.....	3.80	73.65	2.10	9.00	2.05	8.05	1.23	0.00
19.....	3.80	73.65	2.05	8.05	1.87	4.87	1.22	0.00
20.....	3.75	70.70	2.05	8.05	1.76	3.24	1.22	0.00
21.....	3.60	62.15	2.04	7.86	1.68	2.21	1.22	0.00
22.....	3.45	54.10	2.00	7.10	1.61	1.41	Nil ①	
23.....	3.35	49.20	1.95	6.20	1.57	1.03	"	
24.....	3.20	42.60	1.90	5.35	1.51	0.53	"	
25.....	3.05	36.85	1.90	5.35	1.49	0.39	"	
26.....	2.85	29.85	1.88	5.03	1.46	0.21	"	
27.....	2.83	29.17	1.87	4.87	1.45	0.15	"	
28.....	2.80	28.15	1.87	4.87	1.44	0.13	"	
29.....	2.80	28.15	1.85	4.55	1.42	0.09	"	
30.....	2.75	26.50	1.82	4.10	1.41	0.07	"	
31.....			1.79	3.66			"	

① Ice conditions April 1 to 4.

② Gauge heights interpolated April 5 to 10 and 12 to 14.

③ Water standing in pools.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Middle Creek, at Hammond's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		Nil <sup>②</sup>		Nil <sup>②</sup>		Nil <sup>②</sup>		Nil <sup>②</sup>
2								
3								
4								
5								
6								
7								
8								
9								
10								
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18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								

② Water standing in pools.

MONTHLY DISCHARGE of Middle Creek at Hammond's Ranch, for 1912.

(Drainage area 301 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (5-30)	884	26 50	279.91	0.93	0.91	14,434
May	26 50	3.66	12 70	0.042	0.048	781
June	15 65	0.07	2 80	0.009	0.010	167
July	0.05	0.00	0.008			0 5
August						Nil. ①
September						Nil.
October						Nil.
November (1-15)						Nil.
The period					0.968	15,382.5

① Water standing in pools.

LODGE CREEK AT WILLOW CREEK POLICE DETACHMENT.

This station was established on August 13, 1909, by F. H. Peters. It is located on the S.E. ¼ Sec. 12, Tp. 1, Rge. 29, W. 3rd Mer., about 500 feet east of the house at Willow Creek Police Detachment. It is about 75 miles by trail from Maple Creek, and about 35 miles by trail south of Battle Creek post office.

The gauge, which is a plain staff, graduated to feet and hundredths, is fixed to a post on the right bank. An auxiliary gauge, reading from ten to fourteen feet, is located near the top of the right slope opposite the main gauge. The zero of the gauge (elev. 2721.06) is referred to a concrete bench mark (elev. 2768.00 above mean sea level) which was set by the International Boundary Survey upon a hill about 500 feet west of the gauge.

During ordinary stages of flow, discharge measurements are made by wading, and at very low stages a weir is used. There is no bridge or cable structure for obtaining high water measurements. A temporary cable apparatus was used in the spring of 1912.

During 1912, the gauge was read by William Tudgay.

DISCHARGE MEASUREMENTS of Lodge Creek, at Willow Creek Police Detachment, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 16.....	M. H. French.....	54.0	94.70	3.87	4.44	366.90
April 17.....	do.....	49.0	68.72	3.31	3.75	227.30
May 25.....	G. R. Elliott.....	21.0	12.85	0.90	1.73	11.23
June 28.....	do.....	17.0	6.60	0.16	1.31	1.69
Aug. 5.....	do.....				0.83	Nil ①
Aug. 30.....	do.....				0.73	Nil ①
Oct. 11.....	do.....				0.97	Nil ①
Nov. 9.....	do.....				1.00	Nil ①

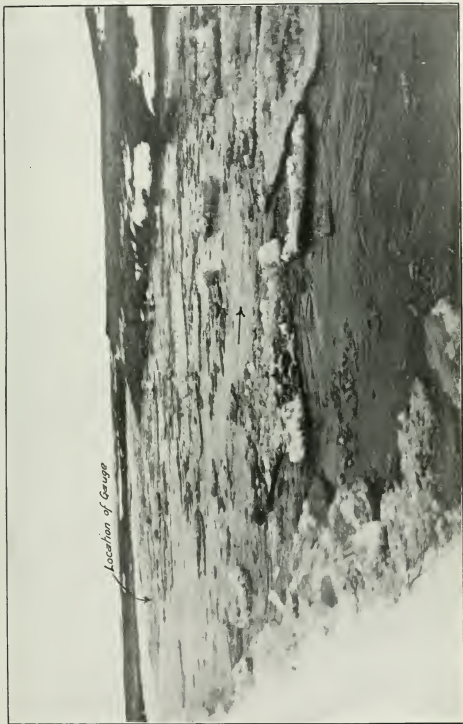
① Water standing in pools.

DAILY GAUGE-HEIGHT AND DISCHARGE of Lodge Creek, at Willow Creek Police Detachment, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.93	.....①	2.41	49.82	2.20	35.30	1.33	1.30
2.....	1.93	.....	2.43	51.46	2.03	25.55	1.32	1.20
3.....	4.33	.....	2.41	49.82	1.92	19.64	1.30	1.00
4.....	5.88	.....①	2.33	43.60	1.85	16.20	1.27	0.78
5.....	11.48	5,700	2.31	42.20	1.81	14.44	1.25	0.60
6.....	10.00	4,200	2.25	38.35	1.78	13.16	1.23	0.48
7.....	9.75	3,970	2.21	35.91	1.75	11.90	1.22	0.42
8.....	9.33	3,580	2.15	32.30	1.71	10.46	1.22	0.42
9.....	8.88	3,190	2.09	28.89	1.68	9.46	1.20	0.30
10.....	7.68	2,220	2.07	27.77	1.63	7.86	1.18	0.24
11.....	7.45	2,060	2.15	32.30	1.58	6.30	1.18	0.24
12.....	7.35	1,960	2.11	30.02	1.53	4.88	1.16	0.18
13.....	7.35	1,960	2.09	28.89	1.50	4.10	1.13	0.11
14.....	5.60	960	2.04	26.10	1.53	4.88	1.13	0.11
15.....	4.60	430	2.00	23.90	1.93	20.16	1.12	0.09
16.....	4.44	380	1.93	20.16	2.70	10.10	1.11	0.07
17.....	3.74	210.20	1.88	17.64	3.18	133.50	1.11	0.07
18.....	3.68	200.34	1.84	15.76	2.43	51.46	1.09	0.04
19.....	3.73	208.50	1.80	14.00	2.23	37.13	1.09	0.04
20.....	3.48	171.24	1.76	12.32	1.98	22.82	1.08	0.03
21.....	3.18	133.50	1.74	11.54	1.70	10.10	1.07	0.02
22.....	3.13	127.50	1.73	11.18	1.51	4.36	1.03	Nil ②
23.....	3.03	115.57	1.77	12.74	1.53	4.88	1.03	"
24.....	2.88	97.86	1.74	11.54	1.48	3.66	1.01	"
25.....	2.86	94.35	1.72	10.82	1.43	2.68	1.01	"
26.....	2.73	80.31	1.72	10.82	1.38	1.92	1.00	"
27.....	2.68	74.80	1.88	17.64	1.34	1.40	0.98	"
28.....	2.61	67.80	1.81	14.44	1.31	1.15	0.96	"
29.....	2.53	60.15	1.77	12.74	1.38	1.92	0.93	"
30.....	2.45	53.10	2.27	39.61	1.33	1.30	0.91	"
31.....			2.38	47.40			0.86	"

① Ice conditions April 1 to 4.

② Water standing in pools.



Lodge Creek at Willow Creek police detachment in Spring of 1912. Taken by W. H. Tudgay.







Lodge Creek at Willow Creek police detachment in October, 1912. Taken by G. R. Elliott.



SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Lodge Creek, at Willow Creek Police Detachment, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.81	Nil ①	0.71	Nil ①	0.83	Nil ①	0.93	Nil ①
2.....	0.83	"	0.68	"	0.83	"	0.93	"
3.....	0.83	"	0.73	"	0.81	"	0.93	"
4.....	0.83	"	0.80	"	0.81	"	0.93	"
5.....	0.83	"	0.78	"	0.80	"	0.99	"
6.....	0.83	"	0.75	"	0.80	"	0.99	"
7.....	0.81	"	0.73	"	0.79	"	1.03	"
8.....	0.78	"	0.71	"	0.78	"	1.02	"
9.....	0.76	"	0.69	"	0.85	"	1.00	"
10.....	0.73	"	0.68	"	0.96	"	1.00	"
11.....	0.68	"	0.66	"	0.95	"	0.99	"
12.....	0.64	"	0.64	"	0.94	"	0.98	"
13.....	0.61	"	0.63	"	0.93	"	0.96	"
14.....	0.58	"	0.61	"	0.91	"	0.96	"
15.....	0.55	"	0.61	"	0.90	"	0.96	"
16.....	0.61	"	0.59	"	0.89	"	.....	.....
17.....	0.58	"	0.58	"	0.88	"	.....	.....
18.....	0.58	"	0.58	"	0.93	"	.....	.....
19.....	0.93	"	0.57	"	0.92	"	.....	.....
20.....	0.98	"	0.56	"	0.92	"	.....	.....
21.....	0.96	"	0.53	"	0.92	"	.....	.....
22.....	0.93	"	0.58	"	0.92	"	.....	.....
23.....	0.88	"	0.58	"	0.91	"	.....	.....
24.....	0.85	"	0.78	"	0.91	"	.....	.....
25.....	0.83	"	0.79	"	0.90	"	.....	.....
26.....	0.83	"	0.81	"	0.90	"	.....	.....
27.....	0.81	"	0.81	"	0.91	"	.....	.....
28.....	0.78	"	0.81	"	0.91	"	.....	.....
29.....	0.78	"	0.83	"	0.92	"	.....	.....
30.....	0.73	"	0.83	"	0.92	"	.....	.....
31.....	0.73	"	.....	.....	0.92	"	.....	.....

① Water standing in pools.

MONTHLY DISCHARGE of Lodge Creek at Willow Creek Police Detachment, for 1912.

(Drainage area 803 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (5-30).....	5.700	53.10	1,242.50	1.55	1.50	64,079
May.....	51.46	10.82	26.51	0.03	0.04	1,630
June.....	133.50	1.15	16.42	0.02	0.02	977
July.....	1.30	0.00	0.25	0.0003	0.0003	15
August.....	.....	.....	.....	.....	.....	Nil. ①
September.....	.....	.....	.....	.....	.....	Nil. ①
October.....	.....	.....	.....	.....	.....	Nil. ①
November (1-15).....	.....	.....	.....	.....	.....	Nil. ①
The period.....	.....	.....	.....	.....	1.56	66,701

① Water standing in pools.

## BATTLE CREEK DRAINAGE BASIN.

*General Description.*

Battle Creek rises in Tp. 8, Rge. 2, W. 4th Mer., and flows in an easterly direction for about eight miles where it crosses the 4th meridian, then turns in a southeasterly direction and crosses the international boundary in Sec. 3, Tp. 1, Rge. 26, W. 3rd Mer., eventually emptying into Milk River near Chinook, Montana. As is characteristic of the streams in this locality, the valley is narrow and deep near the source and gradually broadens out into large flats and meadows. These large flats are first noticed in the vicinity of Battle Creek post office. Near the head of the stream the valley is well wooded with fair sized timber, but this diminishes to a growth of willow brush along the banks and finally disappears altogether.

The chief tributaries of Battle Creek are Tenmile Creek, joining it in Sec. 4, Tp. 6, Rge. 29, W. 3rd Mer., and Sixmile Coulee, joining it in Sec. 21, Tp. 6, Rge. 29, W. 3rd Mer. Stations have been established on both of these streams.

There are three stations on Battle Creek, at the following places:—Nash's ranch, Wilkes' ranch and Tenmile Police Detachment.

Although it will be several years before it reaches its fullest development, the irrigation of the flats along the creek is increasing every year. This, it is expected, will result in a more uniform flow in the creek, as a certain amount of the water diverted by the irrigation ditches will be returned to the creek through seepage.

The principal irrigation schemes under development at the present time are Marshall and Gaff's near Battle Creek post office, and Richardson's, McKinnon's, Stirling's, and Nash's, near Kelvnhurst.

The precipitation in this drainage basin in 1912 was ten inches and was fairly evenly distributed throughout the year. The spring flood was the only flood of the year and took place on April 9. The maximum discharge recorded was at Nash's ranch and was something over 3,000 cu. ft. per sec. This is the largest discharge for a number of years, due to the unusual depth of snow which fell the preceding winter. The discharge dropped fairly evenly from the high spring flow to a minimum of three cu. ft. per sec. in July, and from that increased to about thirty cu. ft. per sec. in November.

In spite of the abnormally high water during the spring flood, the losses were confined almost entirely to the irrigation works. The amount of the loss in this drainage basin to dams, headgates and ditches was about \$5,000, distributed chiefly over five schemes. There was no loss of life, and the damage to other structures was limited to temporary bridges and fences.

## CHEESEMAN DITCH NEAR COULEE.

This station was established on June 24, 1911, by W. A. Fletcher. It is located in the S.W.  $\frac{1}{4}$  Sec. 12, Tp. 8, Rge. 29, W. 3rd Mer., about fifty yards from Ben Cheeseman's house.

The gauge, which is a plain staff graduated in feet and inches, is nailed to a post on the left bank. The zero of the gauge (elev. 96.00) is referred to the top of a stake (assumed elev. 100.00) driven in the ground six feet southwest of the gauge.

The channel is straight for 40 feet above and 30 feet below the station. The bottom of the ditch is composed of clay.

Discharge measurements of ordinary flow are made with a weir. For high discharges a current meter is used. The bench mark is used as the initial point for soundings.

During 1912, no water was used for irrigation.

## SPANGLER DITCH NEAR BATTLE CREEK.

This station was established on June 4, 1912, by G. R. Elliott. It is located about one quarter mile below the former station near the intake of the ditch established by W. A. Fletcher, on July 10, 1911. It is also about one-quarter-mile above J. M. Spangler's house and the gauging station on Sixmile Coulee.

The gauge, which is a plain staff graduated in feet and inches, by saw cuts, is fixed to a braced plank at the left bank. The zero of the gauge (elev. 96.57) is referred to the top of the final point stake (assumed elev. 100.00) on the left bank.

The channel is straight for 30 feet above and 30 feet below the station. The banks are high, clean, grassy and are not liable to overflow. The bed is soft clay.

Discharge measurements are made with a current meter by wading. The initial point for soundings is the face of a stake six inches high on the right bank marked "I.P."

During 1912, the gauge was read by J. M. Spangler.

## SESSIONAL PAPER No. 25d

## DISCHARGE MEASUREMENTS of Spangler's Ditch, near Battle Creek, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 4.....	G. R. Elliott.....	5.6	3.36	0.744	0' 7"	2.50
June 17.....	O. H. Hoover.....	5.9	3.80	0.812	0' 8 $\frac{3}{4}$ "	3.09
June 19.....	do.....	5.8	3.20	0.720	0' 6"	2.31
July 12.....	G. R. Elliott.....	5.5	3.22	0.770	0' 7 $\frac{1}{2}$ "	2.48

## DAILY GAUGE-HEIGHT AND DISCHARGE of Spangler's Ditch, near Battle Creek, for 1912.

DAY.	June.		July.		August.	
	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0' 7"	2.52	0' 1"	0.60
2.....			0' 7"	2.52	0' 1"	0.60
3.....			0' 7"	2.52	0' 1"	0.60
4.....	0' 7"	2.52	0' 7"	2.52		
5.....	0' 7"	2.52	0' 7"	2.52		
6.....	0' 7"	2.52	0' 7"	2.52		
7.....	0' 6"	2.20	0' 7"	2.52		
8.....	0' 6"	2.20	0' 7"	2.52		
9.....	0' 6"	2.20	0' 7"	2.52		
10.....	0' 5"	1.88	0' 7"	2.52		
11.....	0' 5"	1.88	0' 7"	2.52		
12.....	0' 5"	1.88	0' 7"	2.52		
13.....	0' 5"	1.88	0' 7"	2.52		
14.....	0' 5"	1.88	0' 7"	2.52		
15.....	0' 9"	3.16	0' 7"	2.52		
16.....	0' 9"	3.16	0' 8"	2.84		
17.....	0' 9"	3.16	0' 7"	2.52		
18.....	0' 9"	3.16	0' 6"	2.20		
19.....		①	0' 6"	2.20		
20.....			0' 5"	2.20		
21.....			0' 5"	1.88		
22.....			0' 5"	1.88		
23.....			0' 5"	1.88		
24.....		①	0' 4"	1.56		
25.....	0' 7"	2.52	0' 4"	1.56		
26.....	0' 7"	2.52	0' 4"	1.56		
27.....	0' 7"	2.52	0' 3"	1.24		
28.....	0' 7"	2.52	0' 1"	0.60		
29.....	0' 7"	2.52	0' 1"	0.60		
30.....	0' 7"	2.52	0' 1"	0.60		
31.....	0' 7"	2.52	0' 1"	0.60		

① Headgate closed from June 19 to 24.

## MONTHLY DISCHARGE of Spangler's Ditch near Battle Creek, for 1912.

(Drainage area — square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June.....	3 16	1 88	2 45	.....	.....	107
July.....	2 84	0 60	2 04	.....	.....	125
August.....	0 60	0 60	0 60	.....	.....	4
The period.....	.....	.....	.....	.....	.....	236

## SIXMILE COULEE AT SPANGLER'S RANCH.

This station was established April 3, 1912, by M. H. French. It is located on the S.W.  $\frac{1}{4}$  Sec. 6, Tp. 7, Rge. 29, W. 3rd Mer., and is 150 feet from J. M. Spangler's house. It is 34 miles by trail southwest of Maple Creek and six miles north of Battle Creek P.O. It is 850 feet north of the former station established on July 4, 1911.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post sunk in the bed of the stream on the left bank. The zero of the gauge (elev. 96.73) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the left bank in line with the gauging section, and 750 feet east and 290 feet south of the N.E. cor. of Sec. 35, Tp. 6, Rge. 29, W. 3rd Mer.

The channel turns through about 90 degrees at the station and is straight for about 50 feet above and 100 feet below. The banks are covered with brush which causes back water during flood stages. The bed of the stream is composed of sand and gravel, but is not liable to shift. There is a large pond of standing water at the station and at low stages there is practically no current.

Discharge measurements are made at a permanent cross section, 850 feet south and about 2,000 feet downstream from the gauge, with a current meter by wading. The initial point for soundings is a four inch post on the right bank, 55.2 feet from the final point, which is the permanent bench mark. At high water, discharge measurements are made at the bridge 100 feet below the gauge.

During 1912, the gauge was read by J. M. Spangler.

Water is diverted about one-half-mile above the station by J. M. Spangler. Water was used for two months in 1912. The discharge of Spangler's ditch should be added to obtain the total run-off for the station.

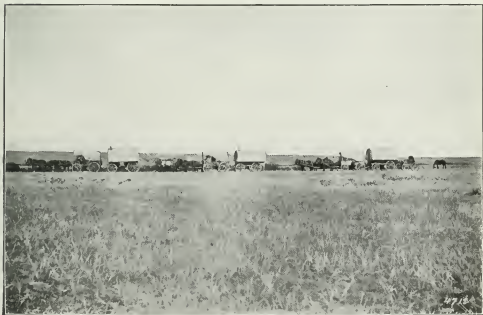
## DISCHARGE MEASUREMENTS of Sixmile Coulee, at Spangler's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 13.....	M. H. French.....	①.....	.....	.....	4.10	33.50
May 3.....	do.....	①.....	.....	.....	2.45	11.66
June 4.....	G. R. Elliott.....	①.....	.....	.....	2.03	4.92
June 17.....	O. H. Hoover.....	①.....	.....	.....	2.05	6.49
June 19.....	do.....	①.....	.....	.....	2.12	6.52
June 20.....	do.....	①.....	.....	.....	2.21	6.82
July 12.....	G. R. Elliott.....	①.....	.....	.....	1.60	0.29
Aug. 8.....	do.....	5.5	1.56	0.37	1.70	0.58
Sept. 7.....	do.....	5.8	2.63	0.48	1.82	1.27
Oct. 3.....	do.....	6.0	2.87	0.65	1.85	1.87
Nov. 14.....	do.....	6.0	3.92	0.86	1.93	3.39
Nov. 27.....	do.....	5.2	2.33	0.35	1.75	0.81

① Gauged downstream.



Battle Creek Valley at Old Fort Walsh. Taken by G. R. Elliott.



Settlers on Battle Creek en route from Wyoming to Peace River. Taken by G. R. Elliott.





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DAILY GAUGE-HEIGHT AND DISCHARGE of Sixmile Coulee at Spangler's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.42	11.12	2.20	7.60	1.85	2.00
2.....			2.40	10.80	2.10	6.00	1.82	1.58
3.....			2.45	11.60	2.03	4.88	1.78	1.12
4.....			2.45	11.60	2.00	4.40	1.72	0.68
5.....			2.55	13.20	2.00	4.40	1.72	0.68
6.....			2.70	15.60	1.80	1.30	1.70	0.56
7.....			2.90	18.60	1.70	0.56	1.68	0.49
8.....			2.70	15.60	1.60	0.29	1.69	0.52
9.....			2.55	13.20	1.50	0.17	1.68	0.49
10.....			2.40	10.80	1.40	0.10	1.62	0.32
11.....			2.30 ①	9.20	1.30	0.05	1.65	0.38
12.....			2.20	7.60	1.20	0.02	1.60	0.29
13.....			2.10	6.00	1.10	0.00	1.64	0.36
14.....	4.80	38.10	2.00	4.40	2.00	4.40	1.60	0.29
15.....	4.60	37.05	2.00 ①	4.40	2.40	10.80	1.70	0.56
16.....	4.80	38.10	2.00	4.40	2.30	9.20	1.65	0.38
17.....	4.20	34.35	2.00	4.40	2.10	6.00	1.65	0.38
18.....	4.20	34.35	1.95	3.60	2.00	4.40	1.65	0.38
19.....	4.00	32.70	2.00 ①	4.40	2.20	7.60	1.65	0.38
20.....	3.95	32.25	2.00	4.40	2.10	6.00	1.65	0.38
21.....	3.88	31.61	2.00	4.40	2.10	6.00	1.63	0.34
22.....	3.74	30.25	1.98	4.08	2.10	6.00	1.63	0.34
23.....	3.60	28.75	1.98	4.08	2.10	6.00	1.63	0.34
24.....	3.50	27.55	1.95	3.60	2.10	6.00	1.63	0.34
25.....	3.25	24.12	1.94	3.44	2.08	5.68	1.62	0.32
26.....	2.75	16.40	1.98	4.08	2.05	5.20	1.65	0.38
27.....	2.66	14.96	2.00	4.40	2.00	4.40	1.65	0.38
28.....	2.60	14.00	2.10	6.00	1.94	3.44	1.65	0.38
29.....	2.55	13.20	2.10	6.00	1.92	3.12	1.65	0.38
30.....	2.46	11.76	2.15	6.80	1.90	2.80	1.65	0.38
31.....			2.15	6.80			1.65	0.38

①Gauge heights interpolated May 11 to 15 and 19.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Sixmile Coulee at Spangler's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.65	0.34	1.76	0.95	1.87	2.32	1.88	2.48
2.....	1.65	0.38	1.77	1.04	1.87	2.32	1.86	2.16
3.....	1.65	0.38	1.77	1.04	1.85	2.00	1.88	2.48
4.....	1.65	0.38	1.76	0.95	1.85	2.00	1.85	2.00
5.....	1.67	0.45	1.78	1.12	1.84	1.84	1.84	1.86
6.....	1.70	0.56	1.79	1.21	1.84	1.84	1.83	1.72
7.....	1.70	0.56	1.82	1.58	1.85	2.00	1.85	2.00
8.....	1.70	0.56	1.81	1.44	1.86	2.16	1.82	1.58
9.....	1.68	0.49	1.81	1.44	1.92	3.12	1.85	2.00
10.....	1.68	0.49	1.80	1.30	1.91	2.96	1.88	2.48
11.....	1.68	0.49	1.78	1.12	1.92	3.12	1.90	2.80
12.....	1.69	0.52	1.78	1.12	1.93	3.28	1.89	2.64
13.....	1.69	0.52	1.79	1.21	1.94	3.44	1.93	3.28
14.....	1.69	0.52	1.76	0.95	1.95	3.60	1.93	3.28
15.....	1.70	0.56	1.81	1.44	2.00	4.40	1.94	3.44
16.....	1.75	0.86	1.81	1.44	2.05	5.20	.....	.....
17.....	1.75	0.86	1.80	1.30	2.10	6.00	.....	.....
18.....	1.75	0.86	1.79	1.21	2.05	5.20	.....	.....
19.....	1.78	1.12	1.81	1.44	2.00	4.40	.....	.....
20.....	1.80	1.30	1.88	2.48	2.00	4.40	.....	.....
21.....	1.79	1.21	1.88	2.48	2.01	4.56	.....	.....
22.....	1.78	1.12	1.88	2.48	2.02	4.72	.....	.....
23.....	1.78	1.12	1.92	3.12	2.01	4.56	.....	.....
24.....	1.77	1.04	1.95	3.60	2.00	4.40	.....	.....
25.....	1.77	1.04	1.94	3.44	1.99	4.24	.....	.....
26.....	1.76	0.95	1.91	2.96	2.00	4.40	.....	.....
27.....	1.75	0.86	1.91	2.96	1.98	4.08	.....	.....
28.....	1.75	0.86	1.90	2.80	1.95	3.60	.....	.....
29.....	1.75	0.86	1.88	2.48	1.89	2.64	.....	.....
30.....	1.76	0.95	1.88	2.48	1.91	2.96	.....	.....
31.....	1.76	0.95	.....	.....	1.88	2.48	.....	.....

## MONTHLY DISCHARGE of Sixmile Coulee at Spangler's Ranch, for 1912.

(Drainage area 44 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (14-30).....	38.10	11.76	27.03	0.614	0.39	911
May.....	18.80	3.44	7.70	0.175	0.21	473
June.....	13.96	1.88	6.02	0.137	0.15	358
July.....	4.52	0.98	2.56	0.058	0.07	157
August.....	1.30	0.38	0.80	0.018	0.02	49
September.....	3.60	0.95	1.82	0.042	0.05	108
October.....	6.00	1.84	3.49	0.079	0.09	215
November (1 to 15).....	3.44	1.58	2.41	0.055	0.03	72
The period.....	.....	.....	.....	.....	1.01	2,343

NOTE.—The above discharge and run-off includes the water diverted by Spangler's ditch above the station.

## LINDNER DITCH NEAR BATTLE CREEK P.O.

This station was established July 26, 1910, by H. R. Carscallen. It is located on Sec. 10, Tp. 6, Rge. 29, W. 3rd Mer., about 100 feet west of the surveyed trail to Maple Creek. It is about a quarter of a mile south of Battle Creek post office, and about 500 yards below the intake of the ditch.

The gauge is a plain staff, graduated to feet and hundredths, driven firmly into the bed of the ditch near the right bank about twelve feet upstream from the weir.

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The channel is straight for 200 feet above and 150 feet below the station, where it curves sharply to the right and enters Lindner Bros.' hay meadow, and is diverted into a number of different laterals for irrigation purposes. The bed of the ditch is composed of clay and coarse gravel. The current is swift below the station.

Discharge measurements are made by means of a 42-inch rectangular sharp-crested weir with complete end contractions.

During 1912, the gauge was read by Philip Lindner.

The discharge at this station must be added to that of Battle Creek at Tenmile Police Detachment when computing the total run-off for the latter station.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Lindner Ditch near Battle Creek, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0.28	1.71			0.83	8.30
2			0.20	1.01			0.83	8.30
3			①			①	0.83	8.30
4					0.68	6.27	0.83	8.30
5					0.68	6.27	0.83	8.30
6					0.68	6.27	0.83	8.30
7					0.68	6.27	0.83	8.30
8					0.68	6.27	0.83	8.30
9					0.38	2.66	0.83	8.30
10					0.38	2.66	0.83	8.30
11					0.38	2.66	0.83	8.30
12					0.38	2.66	③	
13					0.20	1.01		
14						③		
15				①				
16			0.78	7.68				
17			0.78	7.68				
18			0.78	7.68				
19			0.78	7.68				
20			0.78	7.68				
21				③				
22					①	③		
23					0.43	3.20		
24					0.43	3.20		
25					0.43	3.20		
26					0.43	3.20		
27					0.43	3.20		
28	0.83	8.30			0.83	8.30		
29	0.83	8.30			0.83	8.30		
30	0.28	1.71			0.83	8.30		
31								

① Headgate closed May 3 to 15, May 21 to June 3, June 14 to 22.

③ Closed for season.

All gauge heights are heads on permanent 42 inch weir.

## MONTHLY DISCHARGE of Lindner Ditch near Battle Creek, for 1912.

(Drainage area — square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (28-30) . . . . .	8.30	1.71	6.10			36
May . . . . .	7.68	1.01	5.87			82
June . . . . .	8.30	1.01	4.66			166
July (1-11) . . . . .	8.30	8.30	8.30			181
The period . . . . .						465

## TENMILE CREEK AT TENMILE POLICE DETACHMENT.

This station was established July 21, 1909, by H. R. Carscallen. It is located on the S.E.  $\frac{1}{4}$  Sec. 4, Tp. 6, Rge. 29, W. 3rd Mer. It is about 2,500 feet north of the steel highway bridge and gauging station on Battle Creek, and about 1,000 feet north of Tenmile Police Detachment.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post sunk in the bed of the stream on the right bank, 500 feet above the junction of this stream with Battle Creek. The zero of the gauge (elev. 98.42) is referred to the top of the initial point, stake (elev. 105.92), and to the permanent iron bench mark (assumed elev. 100.00) at the steel bridge on Battle Creek.

The channel is straight for 100 feet above and 30 feet below the station. Both banks are high, clean, grassy, and are not liable to overflow. The bed is composed of sand and coarse gravel. The current is swift above and below but is sluggish at the gauge.

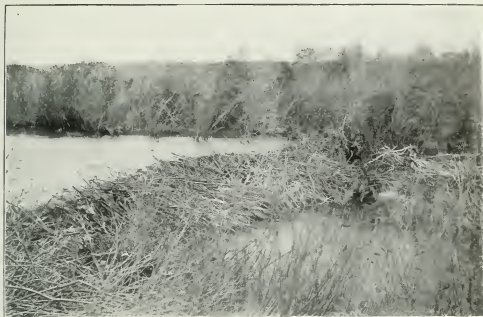
Discharge measurements are made above the gauge at ordinary stages by a weir, and at high stages with a meter by wading. The initial point for soundings is a four-inch stake with "I.P." carved on the face, on the left bank, 70 feet upstream from the gauge.

During 1912, the gauge was read by W. G. Paterson.

## DISCHARGE MEASUREMENTS of Tenmile Creek, at Tenmile Police Detachment, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 27 . . . . .	M. H. French . . . . .				0.94	1.83
June 1 . . . . .	G. R. Elliott . . . . .				0.74	0.36
June 18 . . . . .	O. H. Hoover . . . . .				0.75	0.32
July 6 . . . . .	G. R. Elliott . . . . .				0.70	0.24
July 17 . . . . .	O. H. Hoover . . . . .				0.73	0.27
July 18 . . . . .	do . . . . .				0.73	0.26
Sept. 7 . . . . .	G. R. Elliott . . . . .				0.70	0.22
Nov. 13 . . . . .	do . . . . .				0.98 <sup>①</sup>	0.25

① Gauge height raised by beavers.



Beaver Dam in Battle Creek at Tenmile police detachment. Taken by G. R. Elliott.



Wood and Anderson's Dam and Water Wheel in Mink Creek at Fort Walsh.  
Taken by G. R. Elliott.



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DAILY GAUGE-HEIGHT AND DISCHARGE of Tenmile Creek at Tenmile Police Detachment, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.			0.95	1.96	0.74	0.30	0.73	0.28
2.			0.95	1.96	0.74	0.30	0.73	0.28
3.			0.86	0.99	0.74	0.30	0.73	0.28
4.			0.82	0.70	0.74	0.30	0.74	0.30
5.			0.85	0.90	0.74	0.30	0.73	0.28
6.			0.90	1.36	0.74	0.30	0.70	0.22
7.			0.88	1.17	0.74	0.30	0.70	0.22
8.			0.86	0.99	0.74	0.30	0.70 <sup>①</sup>	0.22
9.			0.85	0.90	0.74	0.30	0.70 <sup>①</sup>	0.22
10.			0.80	0.56	0.74	0.30	0.70 <sup>①</sup>	0.22
11.			0.77	0.42	0.74	0.30	0.70	0.22
12.			0.76	0.37	0.74	0.30	0.70	0.22
13.	1.55	9.52	0.75	0.32	0.74	0.30	0.70	0.22
14.	1.49	8.76	0.75	0.32	0.74	0.30	0.72	0.26
15.	1.40	7.63	0.75	0.32	0.82	0.70	0.71	0.24
16.	1.25	5.74	0.75	0.32	0.76	0.37	0.70	0.22
17.	1.25	5.74	0.74	0.30	0.75	0.32	0.73	0.28
18.	1.15	4.48	0.74	0.30	0.74	0.30	0.73	0.28
19.	1.13	4.23	0.74	0.30	0.74	0.30	0.70	0.22
20.	1.10	3.85	0.75	0.32	0.74	0.30	0.68	0.20
21.	1.80	12.67	0.75	0.32	0.74	0.30	0.68	0.20
22.	1.80	12.67	0.75	0.32	0.73	0.28	0.68 <sup>①</sup>	0.20
23.	1.00	2.59	0.75	0.32	0.73	0.28	0.68	0.20
24.	0.98 <sup>①</sup>	2.34	0.75	0.32	0.73	0.28	0.67	0.19
25.	0.95	1.96	0.74	0.30	0.73	0.28	0.67 <sup>①</sup>	0.19
26.	0.95	1.96	0.74	0.30	0.73	0.28	0.67	0.19
27.	0.95	1.96	0.86	0.99	0.73	0.28	0.68	0.20
28.	0.86	2.09	1.10	3.85	0.74	0.30	0.67	0.19
29.	0.95 <sup>①</sup>	1.96	0.95	1.96	0.74 <sup>①</sup>	0.30	0.68	0.20
30.	0.95	1.96	0.80	0.56	0.73 <sup>①</sup>	0.28	0.70	0.22
31.			0.75	0.32			0.70 <sup>①</sup>	0.22

①Gauge heights interpolated.



## DAILY GAUGE-HEIGHT AND DISCHARGE of Tenmile Creek at Tenmile Police Detachment, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.70 ①	0.22	0.69	0.21	0.80	0.23	0.96	0.26
2.....	0.70 ①	0.22	0.69	0.21	0.81	0.23	0.97	0.26
3.....	0.70	0.22	0.69	0.21	0.81	0.23	0.97	0.26
4.....	0.70	0.22	0.69	0.21	0.81	0.23	0.97	0.26
5.....	0.70	0.22	0.70	0.22	0.81	0.23	0.97	0.26
6.....	0.70 ①	0.22	0.70	0.22	0.81	0.23	0.98	0.26
7.....	0.69	0.21	0.70	0.22	0.82	0.23	0.98	0.26
8.....	0.69	0.21	0.70	0.22	0.82	0.23	0.98	0.26
9.....	0.69	0.21	0.70	0.22	0.82	0.23	0.98	0.26
10.....	0.69 ①	0.21	0.70	0.22	0.83	0.23	0.98	0.26
11.....	0.68	0.20	0.70	0.22	0.84	0.24	0.98	0.26
12.....	0.68	0.20	0.70	0.22	0.85	0.24	0.98	0.26
13.....	0.69 ①	0.21	0.70 ①	0.22	0.86	0.24	0.98	0.26
14.....	0.70	0.22	0.70	0.22	0.87	0.24	0.98	0.26
15.....	0.69	0.21	0.70	0.22	0.88	0.24	0.98 ②	0.26
16.....	0.69	0.21	0.70	0.22	0.89	0.24	.....	.....
17.....	0.69	0.21	0.71 ②	0.22	0.90	0.24	.....	.....
18.....	0.69	0.21	0.71	0.22	0.91	0.24	.....	.....
19.....	0.70 ①	0.22	0.72	0.22	0.92	0.24	.....	.....
20.....	0.70	0.22	0.73	0.22	0.93	0.24	.....	.....
21.....	0.70	0.22	0.73	0.22	0.93	0.25	.....	.....
22.....	0.70	0.22	0.74	0.22	0.94	0.25	.....	.....
23.....	0.69	0.21	0.75	0.22	0.94	0.25	.....	.....
24.....	0.69 ①	0.21	0.75	0.22	0.94	0.25	.....	.....
25.....	0.69 ①	0.21	0.76	0.22	0.95	0.25	.....	.....
26.....	0.69	0.21	0.77	0.22	0.95	0.25	.....	.....
27.....	0.70	0.22	0.77	0.22	0.95	0.25	.....	.....
28.....	0.71	0.24	0.78	0.22	0.95	0.25	.....	.....
29.....	0.70	0.22	0.79	0.22	0.96	0.25	.....	.....
30.....	0.70	0.22	0.80	0.22	0.96	0.25	.....	.....
31.....	0.69	0.21	.....	.....	0.96	0.25	.....	.....

① Gauge height interpolated.

② Gauge height gradually raised by beavers Sept. 19 to Nov. 15.

## MONTHLY DISCHARGE of Tenmile Creek at Tenmile Police Detachment, for 1912.

(Drainage area 24 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (13-30).....	12.67	1.96	5.11	0.213	0.14	182
May.....	1.96	0.30	0.78	0.032	0.04	48
June.....	0.70	0.28	0.51	0.013	0.01	18
July.....	0.30	0.19	0.25	0.010	0.01	14
August.....	0.24	0.20	0.21	0.009	0.01	13
September.....	0.22	0.21	0.22	0.009	0.01	13
October.....	0.25	0.23	0.24	0.010	0.01	15
November (1-15).....	0.26	0.26	0.26	0.011	0.006	8
The period.....	.....	.....	.....	.....	0.24	311

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## BATTLE CREEK AT TENMILE POLICE DETACHMENT

This station was established June 3, 1909, by F. T. Fletcher. It is located below the mouth of Tenmile Creek, at the highway bridge on the surveyed trail from Maple Creek to Tenmile, and about 400 yards from the Tenmile Police Detachment. It is practically in the centre of the N.E.  $\frac{1}{4}$  Sec. 33, Tp. 5, Rge. 29, W. 3rd Mer., about two miles south of Battle Creek post office and 55 miles south of Maple Creek. The bridge is a steel structure of the pony truss type, consisting of one 80 foot span, supported by two timber, rock-filled piers and having a twenty-foot approach at each end of the bridge. There is only one channel at all ordinary stages of the bridge, but owing to the presence of the two piers supporting the truss there are three channels at times of floods.

The gauge, which is of the standard chain type, is located about the centre of the steel truss and is securely fastened to the guard-rail on the downstream side of the bridge. The length of the chain from the bottom of the weight to the marker is 19.11 feet. The zero of the gauge (elev. 86.84) is referred to a permanent iron bench mark (assumed elev. 100.00) at the northeast corner of the bridge. The bench mark stands about three inches above ground and is well protected by rock. It is nine feet southwest of road diversion pin "R.5" and thirty feet northeast of the north end of the bridge pier.

The channel is straight for 500 feet above and 300 feet below the station. Both banks are high and not liable to overflow except in extreme floods, when the water breaks over the right bank some distance above the station and flows around the bridge. The right bank is free of brush for some distance above and below the station; the left bank is sparsely covered with willows near the station. The bed of the stream is sandy and may shift somewhat in high stages of the stream. The current is very sluggish, and at very low stages vegetation appears in the bed of the stream at the station. During the summer months there is a heavy growth of weeds in the bottom of the channel which retards the water and alters conditions at the station.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the inner face of the right abutment. Low water measurements are made by wading near the bridge.

During 1912, the gauge was read by W. G. Paterson.

## DISCHARGE MEASUREMENTS of Battle Creek, at Tenmile Police Detachment, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 10.....	M. H. French.....	47.0	255.	2.35	8.12	600.
April 11.....	do .....	64.0	298.	2.37	8.90	706.
April 26.....	do .....	35.0	80.9	1.20	3.76	96.9
June 1.....	G. R. Elliott.....	35.0	69.0	1.10	3.46	75.7
July 1.....	O. H. Hoover.....	① 31.0	48.5	0.45	2.81	21.9
July 4.....	G. R. Elliott.....	31.0	48.5	0.45	2.85	21.7
July 18.....	O. H. Hoover.....	① 31.0	48.5	0.45	2.78	18.9
July 31.....	G. R. Elliott.....	29.0	49.5	0.27	2.67	11.8
Sept. 7.....	do .....	31.5	51.9	0.35	2.95	18.0
Oct. 4.....	do .....	31.5	49.5	0.35	2.80	17.4
Nov. 5.....	do .....	31.5	50.5	0.32	2.89	16.5
Nov. 5.....	do .....	31.5	53.7	0.47	2.99	25.3
Nov. 5.....	do .....	31.5	56.5	0.54	3.08	30.3
Nov. 13.....	do .....	31.5	52.5	0.54	2.97	28.4
Nov. 21.....	do .....	31.3	45.4	0.40	2.70	18.2
Nov. 21.....	do .....	31.3	45.7	0.40	2.72	18.4
Nov. 27.....	do .....	31.3	47.5	0.33	2.77	15.6

① Gauged downstream from regular section.

DAILY GAUGE-HEIGHT AND DISCHARGE of Battle Creek, at Tenmile Police Detachment, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	6 75	①	3 74	96	3 45	69	2 81	18 8
2	6 95	①	3 71	93	3 32	58	2 80	18 2
3	9 37	771	3 74	96	3 17	46	2 80	18 2
4	9 19	746	3 70	92	3 12	42	2 85	21
5	8 47	647	3 75	96	3 10	40	2 86	22
6	6 37	372	3 92	112	3 07	38	2 82	19 5
7	5 61	285	4 47	166	3 77	98	2 91	26
8	6 50	388	4 07	126	3 67	89	2 95	28
9	7 17	472	3 92	112	3 57	80	2 95①	28
10	7 40	502	3 82	103	3 37	62	3 80①	101
11	7 77	551	3 74	96	3 27	54	3 77	98
12	6 77	421	3 63	86	2 97	30	2 87	23
13	5 17	238	3 55	78	2 95	28	2 82	19 5
14	5 52	276	3 50	74	3 27	54	2 83	20
15	4 41	160	3 49	73	3 27	54	2 92	26
16	4 37	156	3 39	64	3 50	74	2 87	23
17	4 29	148	3 32	58	3 20	48	2 84	21
18	4 18	137	3 31	57	3 08	38	2 80	18 2
19	4 23	142	3 32	58	3 57	80	2 80	18 2
20	4 07	126	3 41	66	3 07	38	2 80	18 2
21	4 17	136	3 32	58	2 95	28	2 79	17 6
22	3 86	107	3 37	62	2 86	22	2 79	17 6
23	3 82	103	3 42	67	2 77	16 4	2 78	17 0
24	3 83	104	3 42	67	2 71	13 0	2 77	16 4
25	3 86	107	3 37	62	2 68	11 5	2 75①	15 2
26	3 76	97	3 37	62	2 67	11 1	2 72	13 6
27	3 74	96	3 77	98	2 69	12 0	2 80	18 2
28	3 56	79	4 35	154	2 91	26	2 72	13 6
29	3 50	74	3 85	106	2 81①	18 8	2 67①	11 1
30	3 55	78	3 70	92	2 81①	18 8	2 62	8 8
31			3 60	83			2 67①	11 1

① Ice conditions April 1 to 3. Not sufficient data to compute discharge.

② Gauge height interpolated.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Battle Creek, at Tenmile Police Detachment, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1....	2 75 ①	15 2	2 75	15.2	2 82 ①	19.5	3.27	54
2....	2 85 ①	21.5	2 77	16.4	2 80	18.2	2 76	15.8
3....	2 92	26	2 78	17.0	2 80	18.2	2 76	15.8
4....	2 90	25	2 80	18.2	2 81	18.8	2 72	13.6
5....	2 86	22	2 82	19.5	2 82 ①	19.5	2 90 ①	25
6....	2 80 ③	18.2	2 87	23	2 82	19.5	2 87	23
7....	2 77	16.4	2 86	22	2 85	21	2 77	16.4
8....	2 75	15.2	2 84	21	2 88	23	2 78 ①	17.0
9....	2 72	13.6	2 88	23	2 95	28	2 80	18.2
10....	2 70 ①	12.5	2 80 ①	18.2	2 94	28	2 81 ①	18.8
11....	2 67	11.1	2 70 ①	12.5	2 92	26	2 82	19.5
12....	2 67	11.1	2 67	11.1	2 91 ①	26	2 83 ①	20
13....	2 70 ①	12.5	2 75	15.2	2 90	25	2 84	21
14....	2 75	12.5	2 77	16.4	2 91 ①	26	2 85	21
15....	2 77	16.4	2 80	18.2	2 91 ①	26	3 12	42
16....	2 79	17.6	2 81 ③	18.8	2 92	26	.....	.....
17....	2 80	18.2	2 82	19.5	2 94 ③	28	.....	.....
18....	2 81	18.8	2 85	21	2 93	27	.....	.....
19....	2 85 ①	21	2 80	18.2	2 92	26	.....	.....
20....	2 90	25	2 82	19.5	2 91 ①	26	.....	.....
21....	2 87	23	2 95	28	2 90	25	.....	.....
22....	2 79	17.6	2 90	25	2 87	23	.....	.....
23....	2 77	16.4	2 89	24	2 86	22	.....	.....
24....	2 75 ①	15.2	2 88	23	2 85 ①	21	.....	.....
25....	2 72 ①	13.6	2 88	23	2 85	21	.....	.....
26....	2 70	12.5	2 86 ③	22	2 85	21	.....	.....
27....	2 72	13.6	2 84 ③	21	2 85	21	.....	.....
28....	2 92	26	2 82	19.5	2 85	21	.....	.....
29....	2 87	23	2 85	21	2 95	28	.....	.....
30....	2 85	21	2 81	18.8	3 00 ①	32	.....	.....
31....	2 80	18.2	.....	.....	3 12	42	.....	.....

① Gauge height interpolated.

## MONTHLY DISCHARGE of Battle Creek at Tenmile Police Detachment, for 1912.

(Drainage area 201 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (3-30).....	771	74	209	1.34	1.39	14,939
May.....	166	57	87.5	0.435	0.50	5,380
June.....	98	11.1	43.2	0.214	0.24	2,571
July.....	101	8.8	24.1	0.120	0.14	1,482
August.....	26	11.1	17.7	0.088	0.10	1,088
September.....	28	11.1	19.6	0.097	0.11	1,166
October.....	42	18.2	24.2	0.120	0.14	1,488
November (1-15).....	54	13.6	22.7	0.113	0.06	675
The period.....	.....	.....	.....	.....	2.68	28,789

## MARSHALL AND GAFF DITCH NEAR TENMILE POLICE DETACHMENT.

This station was established on July 11, 1911, by W. A. Fletcher. It is located in the N. E.  $\frac{1}{4}$  Sec. 33, Tp. 5, Rge. 29, W. 3rd Mer., about one half mile below the regular station upon Battle Creek near the Tenmile Police Detachment.

The gauge, which is a plain staff, graduated in feet and inches, is nailed to a post sunk in the ditch near the right bank, 250 feet below the headgate. The zero of the gauge is referred to the top of a three inch stake on the right bank near the gauge.

The channel is straight for 100 feet above and 40 feet below the station. The bed is muddy and covered with weeds.

Measurements are made at the station with a current meter by wading. The initial point for soundings is the bench mark.

Records of gauge heights for 1912 have not been received. Water was diverted during June, July and part of August. An estimate of the discharge may be made from the records obtained at a point below, which are given under Gaff ditch.

## GAFF DITCH NEAR TENMILE POLICE DETACHMENT.

This station was established on July 11, 1911, by W. A. Fletcher. It is located on the S. W.  $\frac{1}{4}$  Sec. 25, Tp. 5, Rge. 29, W. 3rd Mer., about half a mile from Mr. Gaff's house.

The gauge, which is a plain board divided into feet and inches, is nailed to a post at the right bank. The zero of the gauge (elev. 96.90) is referred to the top of a stake driven in the ground three feet southwest of the gauge.

The channel is straight for 200 feet above and 300 feet below the station. The bottom of the ditch is composed of a sandy loam.

Discharge measurements are made with a current meter by wading. The initial point for soundings is the bench mark stake.

During 1912, the gauge was read by J. A. Gaff.

## DISCHARGE MEASUREMENTS of Gaff Ditch, near Tenmile Police Detachment, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 26.....	O. H. Hoover.....	7.1	8.80	1.23	1.52	10.78
July 4.....	G. R. Elliott.....	①	.....	.....	0.25	0.26
July 6.....	do.....	①	.....	.....	0.17	..... ②
July 8.....	do.....	①	.....	.....	1.67	11.77
July 31.....	do.....	6.2	4.97	0.84	1.00	4.19

① Weir measurements.

② Discharge too small to measure.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Gaff Ditch, near Tenmile Police Detachment, for 1912.

DAY.	June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1.38	8.0
2.....			1.50	9.6
3.....			1.58	10.7
4.....			0.50	1.02
5.....			0.33	0.48
6.....				
7.....	① 1.71	12.3	0.17	③ 0.12
8.....	2.04	16.9		
9.....	1.96	15.7	1.54	① 10.1
10.....	2.00	16.3	1.50	9.6
11.....	1.96	15.7	1.58	10.7
12.....	1.88	14.6	1.46	9.1
13.....	1.92	15.2	1.62	③ 11.2
14.....	2.17	18.6		
15.....	2.38	21.4		
16.....	1.94	15.5		
17.....	2.08	17.5		
18.....	1.62	11.2		
19.....	2.04	16.9		
20.....	2.00	16.3		
21.....	1.92	15.2		
22.....	1.88	14.6		
23.....	1.88	14.6		
24.....	1.88	14.6		
25.....	1.71	12.3		
26.....	1.71	12.3		
27.....	1.62	11.2		
28.....	1.71	12.3		
29.....	1.54	10.1		
30.....	1.38	8.0		
31.....				

① Headgates of ditch opened.

③ Headgates of ditch closed.

MONTHLY DISCHARGE of Gaff Ditch, near Tenmile Police Detachment, for 1912.

(Drainage area — square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June.....	21.4	0.00	14.6			695
July (1 to 27).....	11.2	0.00	7.33			160
The period.....						855

## BATTLE CREEK AT WILSON'S RANCH.

This station was established July 5, 1910, by H. R. Carscallen. It is located on the S. W.  $\frac{1}{4}$  Sec. 2, Tp. 6, Rge. 28, W. 3rd Mer. Owing to the difficulty of securing an observer, this station has been abandoned and a new one was established at Wilkes' ranch on May 29, 1912.

## BATTLE CREEK AT WILKES' RANCH.

This station was established May 29, 1912, by G. R. Elliott. It is located on the N. W.  $\frac{1}{4}$  Sec. 33, Tp. 5, Rge. 27, W. 3rd Mer., and is twelve miles straight east of Tenmile Police Detachment and about ten miles north of Kelvindhurst post office.

The gauge, which is a plain staff graduated in feet and hundredths, is nailed to a well braced post sunk in the bed of the stream at the left bank, and is 120 feet from Wilkes' house. The zero of the gauge (elev. 89.86) is referred to a permanent iron bench mark (assumed elev. 100.00) located on the left bank 750 feet downstream from the gauge.

The channel curves at the gauge. Both banks are fairly high, sandy and not liable to overflow. The bed is composed of clean sand and is somewhat shifting.

Discharge measurements are made with a current meter by wading. The initial point for soundings is a five inch stake marked "I.P." in red paint, located on the left bank, 1700 feet downstream from the gauge. The final point, 171 feet distant, is 654 feet north and 255 feet east of the quarter mound east of Sec. 32, Tp. 5, Rge. 27, W. 3rd Mer.

During 1912, the gauge was read by Mrs. Bertha Wilkes.

Water was diverted in 1912 during June and July by Marshall and Gaff ditch, twenty miles above this station.

#### DISCHARGE MEASUREMENTS of Battle Creek, at Wilkes' Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 29	M. H. French.....	33.3	34.8	2.68	2.88	93.42
May 29....	G. R. Elliott.....	36.0	53.7	2.95	3.26	158.20
June 24....	O. H. Hoover.....				2.00	16.40 ①
July 5.....	G. R. Elliott.....	26.0	15.1	2.02	2.06	30.54
July 5.....	do.....	26.0	15.1	2.06	2.06	31.13
Aug. 12....	do.....	25.5	7.93	1.09	1.74	8.65
Sep. 12....	do.....	27.0	12.7	1.35	1.87	17.12
Oct. 18....	do.....	27.5	16.2	1.54	2.02	24.92
Nov. 6.....	do.....	28.5	18.2	0.18	2.29	8.73 ①
Nov. 22....	do.....	31.0	21.7	1.35	2.49	29.30 ①

① Gauged at different section.

② Ice conditions.

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Battle Creek, at Wilkes' Ranch, for 1912.

DAY.	May.		June.		July.	
	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.84	288	2.79	89	1.73	8.9
2.....	3.84	288	2.72	81	1.73	8.9
3.....	3.81	279	2.62	72	1.74	9.3
4.....	3.83	285	2.50	61	1.82	13.4
5.....	3.83	285	2.44	56	2.05	27
6.....	3.82	282	2.34	48	1.89	17.3
7.....	3.82	282	2.25	41	1.98	23.0
8.....	3.96	323	2.19	37	1.86	15.6
9.....	4.02	343	2.15	34	1.80	12.3
10.....	4.01	340	2.15	34	1.79	11.8
11.....	3.96	324	2.12	32	1.77	10.8
12.....	3.90	305	2.08	29	1.84	14.5
13.....	3.83	285	2.06	28	1.80	12.3
14.....	3.72	256	2.09	30	1.81	12.8
15.....	3.68	247	2.10	30	1.87	16.2
16.....	3.69	249	2.16	35	1.89	17.3
17.....	3.61	230	2.19	37	1.85	15.0
18.....	3.57	221	2.26	42	1.85	15.0
19.....	3.55	216	2.24	40	1.86	15.6
20.....	3.55	216	2.03	26	1.86	15.6
21.....	3.58	223	2.08	29	1.86	15.6
22.....	3.60	227	1.98	23	1.85	15.0
23.....	3.63	234	1.93	20	1.86	15.6
24.....	3.63	234	1.84	20	1.85	15.0
25.....	3.60	227	1.83	14.9	1.85	15.0
26.....	3.60	227	1.80	12.3	1.86	15.6
27.....	3.64	237	1.77	11.8	1.88	16.7
28.....	3.42	189	1.73	8.9	1.86	15.6
29.....	3.28	162	1.73	8.9	1.81	12.8
30.....	2.99	114	1.70	7.5	1.78	11.3
31.....	2.80	90			1.75	9.8

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Battle Creek, at Wilkes' Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.65	5.4	1.95	21	1.96	22	2.32	35 ①
2.....	1.65	5.4	1.89	17.3	1.94	20	2.38	30
3.....	1.68	6.7	1.86	15.6	1.84	14.5	2.46	26
4.....	1.75	9.8	1.86	15.6	1.82	13.4	2.46	26
5.....	1.85	15.0	1.90	17.9	1.91	18.5	2.46	26
6.....	1.88	16.7	1.95	21	1.91	18.5	2.38	18.0
7.....	1.85	15.0	1.99	23.4	1.88	16.7	2.31	11.0
8.....	1.84	14.5	2.08	29	1.90	17.9	2.22	10.0
9.....	1.81	12.8	1.87	16.2	1.92	19.1	2.45	25
10.....	1.80	12.3	1.87	16.2	1.96	22	2.70	25
11.....	1.78	11.3	1.87	16.2	2.00	24	2.66	27
12.....	1.75	9.8	1.87	16.2	2.01	25	2.47	27
13.....	1.73	8.9	1.86	15.6	2.00	24	2.18	15.0
14.....	1.81	12.8	1.86	15.6	2.00	24	2.38	18.0
15.....	2.10	30.	1.86	15.6	2.01	25	2.40	20 ①
16.....	2.15	34	1.88	16.7	2.03	26		
17.....	1.88	16.7	1.88	16.7	2.05	27		
18.....	1.85	15.0	1.89	17.3	2.03	26		
19.....	1.85	15.0	1.89	17.3	2.12	32		
20.....	1.85	15.0	1.89	17.3	2.12	32		
21.....	1.88	16.7	1.89	17.3	2.18	36		
22.....	1.85	15.0	1.90	17.9	2.24	40		
23.....	1.85	15.0	1.98	23	2.24	40		
24.....	1.83	13.9	1.98	23	2.24	40		
25.....	1.83	13.9	1.98	23	2.24	40		
26.....	1.82	13.4	1.95	21	2.10	30		
27.....	1.80	12.3	1.95	21	2.10	30		
28.....	1.78	11.3	1.95	21	2.10	30		
29.....	1.85	15.0	1.96	22	2.16	35		
30.....	1.86	15.6	1.96	22	2.20	37		
31.....	1.86	15.6			2.26	42		

① Ice conditions Nov. 1 to 15. Discharge only approximate.

## MONTHLY DISCHARGE of Battle Creek, at Wilkes' Ranch, for 1912.

(Drainage area 297 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May.....	343	90	249	0.837	0.96	15,289
June.....	89	7.5	34.6	0.117	0.13	2,060
July.....	27	8.9	14.5	0.049	0.06	894
August.....	34	5.4	14.2	0.048	0.06	872
September.....	23	15.6	19.0	0.064	0.07	1,128
October.....	42	13.4	27.3	0.092	0.11	1,681
November (1-15).....	35	10	22.6	0.076	0.04	672 ①
The period.....					1.43	22,596

① Ice conditions Nov. 1 to 15.  
Discharge only approximate.

## GILCHRIST BROTHERS' DITCH NEAR KELVINHURST.

This station was established on October 16, 1911, by F. T. Fletcher. It is located on the S. W.  $\frac{1}{4}$  Sec. 11, Tp. 5, Rge. 27, W. 3rd Mer., at the intake to the ditch.

The gauge, which is a plain staff graduated to feet and inches, is nailed to the right side of a flume at a point 45 feet from the intake gate. The zero of the gauge (elev. 96.92) is referred to the top of a post (assumed elev. 100.00) at the lower end of the flume.



Discharge measurements are made with a current meter. The initial point for soundings is the right side of the flume at the gauge. Low discharges are measured with a weir below the flume.

No water was diverted during 1912.

#### RICHARDSON DITCH NEAR KELVINHURST.

This station was established on October 14, 1911, by F. T. Fletcher. It is located on the S.-E.  $\frac{1}{4}$  Sec. 2, Tp. 5, Rge. 27, W. 3rd Mer., 192 feet east and twelve feet north of the southwest corner of the quarter section.

The gauge, which is a plain staff graduated to feet and inches, is nailed to a post at the right bank of the ditch. The top of the gauge (elev. 99.79) is referred to the top of the pin (assumed elev. 100.00) in the quarter mound on the north boundary of Sec. 35, Tp. 4, Rge. 27, W. 3rd Mer.

The ditch is straight for 200 feet above and 500 feet below the gauge. The cross-section is uniform and the banks are in good condition.

Discharge measurements are made with a current meter by wading. The initial point for soundings is a square-topped stake on the left bank, 27 feet downstream from the gauge. Low discharges are measured with a weir.

No water was diverted during 1912.

#### MCKINNON DITCH NEAR KELVINHURST.

This station was established on October 20 1911, by F. T. Fletcher. It is located on the N. W.  $\frac{1}{4}$  Sec. 20, Tp. 4, Rge. 26, W. 3rd Mer., about 364 feet south and 127 feet east of the N. W. corner of Sec. 20, and near James McKinnon's house.

The gauge, which is a plain staff graduated to feet and inches, is mailed to a post near the left bank of the ditch. The top of the gauge (elev. 100.59) is referred to the top of a stake (assumed elev. 100.00) thirteen feet downstream from the gauge.

The ditch is straight for 75 feet above and 1,500 feet below the gauge. The bed and banks of the ditch are composed of clay. The cross-section is uniform and the banks are in good condition at the gauge. The fall is one and a half feet per mile.

Discharge measurements are made with a meter by wading. The initial point for soundings is a square-topped stake on the left bank 13 feet downstream from the gauge. Low discharges are measured with a weir.

No water was diverted during 1912.

#### STIRLING AND NASH DITCH NEAR KELVINHURST.

This station was established on July 11, 1911, by M. H. French. It is located on Sec. 22, Tp. 3, Rge. 27, W. 3rd Mer., and is about one mile from the headgate of the ditch and 1,000 feet east of Stirling Brothers' house.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post and braced to a small bridge near the centre of the ditch. The zero of the gauge (elev. 94.81) is referred to the top of a stake (assumed elev. 100.00) on the right bank.

The ditch is straight for 1,000 feet above and 600 feet below the gauge. The cross-section is uniform and the bed and banks of the ditch are in good condition at this point.

Discharge measurements are made with a current meter by wading, near the gauge at ordinary stages, but during low water a weir is used.

During 1912, the gauge was read by Robert Stirling.

Sufficient discharge measurements have not been made to determine accurately the daily discharge for 1912. The ditch was in use 49 days from July 3 to August 20, inclusive, and the mean discharge during this period was approximately 1.7 cu. ft. per sec.

#### BATTLE CREEK AT NASH'S RANCH.

This station was established May 11, 1910, by N. M. Sutherland. It is located on the N. E.  $\frac{1}{4}$  Sec. 3, Tp. 3, Rge. 27, W. 3rd Mer., and is 270 feet west of E. R. Nash's house. It is about 70 miles by trail from Maple Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is fastened to a post sunk in the bed of the stream on the left bank. The zero (elev. 90.23) is referred to a permanent iron bench mark (assumed elev. 100.00), on the left bank, seven feet east of the initial point of soundings, and in the line of the cross-section. The bench mark is also 1902.6 feet S.  $81^{\circ} 28'$  W. from the N. E. cor. Sec. 3, Tp. 3, Rge. 27, W. 3rd Mer. It is about eight inches above ground and is protected by a mound of rock.

The stream flows in one channel 45 feet wide at ordinary stages. The channel is straight for about 250 feet above and 300 feet below the station. The right bank is solid clay, high and

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not liable to overflow. The left bank is also of clay, but is low, and liable to overflow during high stages of the stream. The bed of the stream is composed of sand and gravel and may shift in high stages of the stream.

Discharge measurements are made at ordinary stages with a current meter by wading. At high stages the stream cannot be waded, and the discharge is computed from slope measurements. The initial point for soundings is the face of a five inch post on the left bank, 27 feet upstream from the gauge and marked "I.P." in red paint.

During 1912, the gauge was read by E. R. Nash.

This station is below all irrigation ditches on Battle Creek except the Badger ditch. During 1912, the Stirling and Nash ditch diverted an average of about two cu. ft. per sec. during July and most of August.

## DISCHARGE MEASUREMENTS of Battle Creek, at Nash's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 19.....	M. H. French.....	93.7	102.70	1.98	2.82	201
April 20.....	do .....	92.3	95.40	1.94	2.66	185
May 26.....	G. R. Elliott.....	42.5	52.20	1.38	1.51	71.8
July 1.....	do .....	40.5	12.14	0.39	0.48	4.68
Aug. 3.....	do .....	40.5	12.95	0.33	0.50	4.31
Sept. 5.....	do .....	40.5	21.86	0.69	0.72	15.1
Oct. 16.....	do .....	41.7	26.06	0.89	0.86	23.2
Nov. 7.....	do .....	42.0	29.03	0.82	0.92	23.8①
Nov. 23.....	do .....	42.0	25.80	0.61	0.85	15.6①

① Affected by ice.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Battle Creek, at Nash's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.38	.....①	1.82	98	1.83	99	0.48	4.3
2.....	3.38	.....	1.79	95	1.64	82	0.43	3.0
3.....	3.54	.....	1.88	103	1.58	77	0.44	3.2
4.....	4.02	.....	1.86	102	1.47	68	0.44	3.2
5.....	9.80	.....	1.81	97	1.41	63	0.45	3.4
6.....	12.00	.....	1.87	102	1.33	57	0.44	3.2
7.....	14.50	.....	1.85	101	1.29	54	0.42	2.9
8.....	15.80	.....①	1.95	110	1.23	49	0.63	10.6
9.....	9.30①	3,026	1.93	108	1.05	36	0.64	11.1
10.....	8.40	2,270	1.94	109	0.99	32	0.60	9.2
11.....	7.60	1,745	1.97	112	1.00	32	0.74	16.4
12.....	6.80	1,310	1.86	102	0.99	32	0.71	14.7
13.....	6.10	1,025	1.84	100	0.97	30	0.54	6.6
14.....	5.50①	829	1.71	88	0.98	31	0.55	7.0
15.....	4.93	660	1.69	86	1.00	32	0.53	6.2
16.....	3.79	387	1.61	79	1.03	34	0.44	3.2
17.....	3.39	299	1.60	79	1.00	32	0.55	7.0
18.....	3.09	243	1.60	79	0.99	32	0.59	8.8
19.....	2.92	216	1.50	70	1.00	32	0.65	11.6
20.....	2.71	190	1.50	70	1.17	45	0.64	11.1
21.....	1.89	104	1.48	69	1.00	32	0.62	10.2
22.....	2.39	154	1.47	68	0.83	22	0.67	12.6
23.....	2.28	142	1.56	75	0.88	25	0.74	16.4
24.....	2.20	134	1.52	72	0.81	21	0.58	8.3
25.....	2.19	133	1.54	74	0.73	15.9	0.56	7.4
26.....	2.15	130	1.51	71	0.65	11.6	0.60	9.2
27.....	2.14	128	1.59	78	0.65	11.6	0.50	5.0
28.....	2.05	120	1.54	74	0.63	10.6	0.54	6.6
29.....	1.98	113	1.63	81	0.63	10.6	0.47	4.0
30.....	1.93	108	2.03	117	0.63	10.6	0.54	6.6
31.....			1.91	106			0.51	5.4

① Ice conditions. Not sufficient data to compute the daily discharge until April. 9.

② Gauge taken out by ice. Gauge heights April 9 to 14 interpolated from marks indicated by observer.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Battle Creek, at Nash's Ranch, for 1912.

DAY.	August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.54	6.6	0.69	13.7	0.83	22
2.....	0.50	5.0	0.74	16.4	0.80	20
3.....	0.47	4.0	0.76	17.6	0.79	19.4
4.....	0.50	5.0	0.74	16.4	0.78	18.8
5.....	0.51	5.4	0.73	15.9	0.78	18.8
6.....	0.49	4.7	0.75	17.0	0.78	18.8
7.....	0.51	5.4	0.76	17.6	0.76	17.6
8.....	0.59	8.8	0.75	17.0	0.76	17.6
9.....	0.61	9.7	0.70	14.2	0.83	22
10.....	0.59	8.8	0.71	14.7	0.81	21
11.....	0.57	7.9	0.78	18.8	0.80	20
12.....	0.54	6.6	0.75	17.0	0.83	22
13.....	0.55	7.0	0.75	17.0	0.86	24
14.....	0.54	6.6	0.74	16.4	0.86	24
15.....	0.51	5.4	0.74	16.4	0.86	24
16.....	0.54	6.6	0.72	15.3	0.86	24
17.....	0.55	7.0	0.71	14.7	0.87	24
18.....	0.84	22.0	0.71	14.7	0.91	27
19.....	0.75	17.0	0.68	13.2	0.88	25
20.....	0.75	17.0	0.70	14.2	0.88	25
21.....	0.75	17.0	0.71	14.7	0.91	27
22.....	0.75	17.0	0.74	16.4	0.92	27
23.....	0.75	17.0	0.75	17.0	0.97	30
24.....	0.75	17.0	0.79	19.4	1.03	34
25.....	0.74	16.5	0.83	22	0.98	31
26.....	0.69	13.7	0.71	14.7	0.90	26
27.....	0.67	12.6	0.74	16.4	0.90	26
28.....	0.67	12.6	0.83	22	0.89	26
29.....	0.67	12.6	0.81	21	0.91	27
30.....	0.67	12.6	0.82	21	0.94	29
31.....	0.66	12.1	.....	.....	0.95	29

## MONTHLY DISCHARGE of Battle Creek at Nash's Ranch, for 1912.

(Drainage area 500 square miles.)

MONTH.	DISCHARGE IN SECOND-FOOT.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	3026	108	612	1.22	1.00	26,706
May.....	117	68	89.5	0.179	0.21	5,503
June.....	99	10.6	37.3	0.075	0.08	2,220
July.....	16.4	3.0	7.69	0.015	0.02	473
August.....	22	4.0	10.6	0.021	0.02	652
September.....	22	13.2	16.7	0.033	0.04	994
October.....	34	17.6	24.1	0.048	0.05	1,482
The period.....					1.42	38,030

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Battle Creek drainage Basin, in 1912.

Date.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. feet.	Ft. per Sec.	Sec.-ft.
July 1.....	G. R. Elliott.....	Battle Creek.....	16-2-26-3.....	27.2	16.17	0.71	11.59
Nov. 21.....	do.....	do.....	N.W. 21-7-29-3.....	11.5	8.86	0.92	8.12

## FRENCHMAN RIVER DRAINAGE BASIN.

*General Description.*

Frenchman River drains the greater portion of southwestern Saskatchewan. It rises in Cypress Lake in Tp. 6, Rge. 26, W. 3rd Mer., and follows a southeasterly course for some 150 miles, crossing into the United States in Range 10, West of the Third Meridian. It eventually finds its way into Milk River near Saco, Montana, and therefore forms a part of the general drainage basin of the Missouri.

Cypress Lake is on the southern slope of Cypress Hills at an elevation of about 3240 feet above sea level. It occupies what is probably a portion of an abandoned water course, or channel, of an ancient river, which joined Battle Creek to the Frenchman River. The water of the lake is fresh and is supplied by a number of coulees and small streams which head in the hills to the north. The largest of these are Oxart and Sucker Creeks, both of which have a small continuous flow.

During dry years Cypress Lake does not overflow and the whole discharge of the Frenchman River is derived from Belanger, Davis and Fairwell Creeks and the north branch. From Township 6, Range 23, West of the Third Meridian, where the north branch joins the main stream, there is no appreciable supply to the river while in Canada. Mule Creek, which joins the river in Township 5, Range 17, West of the Third Meridian, and Snake Creek in Township 3, Range 13, West of the Third Meridian, have, however, a small flow.

The country surrounding Cypress Lake is of rolling prairie much broken by coulees. In many of these there is considerable tree growth, but for the most part the country is devoid of all vegetation other than grasses. All the streams in the upper section of the drainage basin, with the exception of the north branch, rise on the plateau at the top of the hills. Flowing southward they break through deep, well wooded gorges before reaching the lower flats along the river. The north branch, however, is in a deep valley throughout its entire length. Its feeders, like the western tributaries of the main stream, cut through from the bench to the valley in deep, well wooded coulees. Below the mouth of the north branch there is little tree growth. Here and there along the river may be found a small growth of shrubs and maple, while on the hill-sides in some of the coulees there are small clumps of poplar covering an acre or so. Most of these coulees are rapidly becoming cleared by the settlers who are taking up the benches above the river valley. The bench lands are well covered with grasses, but the hills and sides of the valley are almost devoid of vegetation. In the flats along the river, except where irrigated, the chief vegetation consists of sage brush and cactus.

When the Frenchman leaves the lake it flows through a wide flat valley as far as the mouth of Fairwell Creek. Most of this land is under proposed or constructed irrigation ditches, covering an area of about 393 acres. Below this point the valley becomes more broken and narrows considerably, while the side hills become higher. Small portions of this bottom will no doubt be brought under irrigation, but as yet little has been done in that direction.

Below the junction of the north branch the valley becomes rough and rugged, the sides being cut with buttes and deep coulees. Here numerous outcroppings of lignite may be seen and also a deep seam of light colored clay and sand. This seam, which has been bleached almost a pure white, may be seen at many points along the river's entire course and is one of the most conspicuous objects in this region. From its color and nature the river receives its local name of the "Whitemud."

At East End, some miles lower down, the valley again widens out into flats. Here is located the largest irrigation project in the Cypress Hills district. Messrs. Strong and Day have a large dam in the river and a system of ditches and storage reservoirs, by which they irrigate 2,581 acres. Directly above this project there are two smaller schemes covering 200 acres. Just below, Messrs. Morrison Brothers have a dam and ditch which will irrigate 1,595 acres. Their ditch is carried across the river and continued by Messrs. Duncan and Watson who irrigate 935 acres more.

This East End flat is of a sandy nature and when under irrigation it has been found that a considerable portion of the water used finds its way back to the stream in a short distance. A series of measurements made August 31, 1911, after the flat had been well soaked by rains and irrigation, shows this to be true. Measurements made at Morrison's dam showed that about 50 per cent of the water flowing in Enright and Strong's ditch had again reached the river at this point. At Duncan's house it was found that 80% of the discharge of Morrison's ditch had returned to the river. From Duncan's house to the mouth of Mule Creek there was a loss of about 45%, due no doubt to seepage and evaporation. Below the East End flat none of the flats, which occur at various points along the river, are irrigated as yet. A short distance below the mouth of Snake Creek the river enters "bad lands" which continue into the United States.

The mean annual rainfall of this basin is not well established but it is estimated that it would range from 12 to 16 inches, most of which falls in May, June and July. From November to April the streams are frozen over, and usually there is an abundant snowfall.

Damage to the extent of about \$5,000.00 was caused by the spring floods of 1912.

## OXART CREEK AT WYLIE'S RANCH.

This station was established June 15, 1909, by H. R. Carscallen. It is located on the N.E.  $\frac{1}{4}$  Sec. 20, Tp. 6, Rge. 27, W. 3rd Mer., three miles above the point where the creek flows into Cypress Lake, and thirty-five miles south of Maple Creek. It is above the intake of Joseph Wylie's irrigation ditch.

The gauge, which is a plain staff graduated in feet and hundredths, is attached to a braced post sunk in the bed of the stream on the left bank. The zero of the gauge (elev. 95.28) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the right bank, four feet from the final point stake and in line with the cross-section.

The channel is straight for ten feet upstream, at which point four small courses converge. It is straight for twenty feet downstream and then is turned almost at right angles by Mr. Wylie's dam. Both banks are low, sodded and are liable to overflow at very high stages. The bed is coarse gravel and shifts during floods. During high stages the creek has several channels. On account of the porous gravel bed there is considerable seepage near the gauge.

Discharge measurements are made during high stages at the gauge with a current meter by wading. The initial point for soundings is a square stake, driven close to the ground on the left bank and marked "I.P.". During ordinary stages measurements are made seventy-five feet downstream from the gauge, where the current is swift.

During 1912, the gauge was read by Mrs. Rachel Wylie.

#### DISCHARGE MEASUREMENTS of Oxart Creek at Wylie's Ranch, in 1912.

Date.	Hydrographer.	Width.		Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.				
April 9.....	M. H. French.....	142.0	145	2.45	3.45	354	
April 24.....	do.....	18.8	11.2	1.62	1.26	18.2	
May 29.....	G. R. Elliott.....	16.0	9.0	1.58	1.10	14.2	
June 24.....	O. H. Hoover.....				0.67	2.73①	
July 5.....	G. R. Elliott.....	9.0	2.46	0.93	0.56	2.30	
Aug. 13.....	do.....	7.0	1.82	0.64	0.42	1.16	
Sept. 13.....	do.....	6.0	1.14	1.04	0.39	1.19	
Oct. 18.....	do.....				0.38	0.47①	
Nov. 6.....	do.....				0.40	0.48①	

① Gauged downstream from gauge.

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Oxart Creek, at Wylie's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1.10	14.2	0.62	6.2	0.62	2.5
2.....			1.07	13.7	0.62	6.1	0.62	2.5
3.....			0.70	7.4	0.62	6.0	0.62	2.5
4.....			0.65	6.7	0.62	5.9	0.62	2.5
5.....			0.65	6.7	0.62	5.8	0.56	2.3
6.....			0.60	6.0	0.62	5.7	0.56	2.3
7.....			0.82	9.3	0.62	5.6	0.56	2.3
8.....	4.00	537	0.94	11.3	0.62	5.5	0.56	2.3
9.....	3.50	370	0.95	11.5	0.62	5.3	0.56	2.3
10.....	3.38	333	0.75	8.2	0.62	5.1	0.56	2.3
11.....	2.95	210	0.65	6.7	0.62	5.0	0.56	2.3
12.....	2.48	111	0.65	6.7	0.62	5.0	0.56	2.3
13.....	2.00	55	0.60	6.0	0.78	7.0	0.56	2.2
14.....	1.90	48	0.58	5.7	0.78	6.8	0.56	2.2
15.....	1.70	35	0.58	5.7	0.78	6.7	0.56	2.2
16.....	1.68	34	0.60	6.0	0.78	6.5	0.56	2.2
17.....	1.56	28	0.60	6.0	0.75	6.0	0.56	2.2
18.....	1.52	27	0.60	6.0	0.75	6.0	0.56	2.2
19.....	1.44	24	0.60	6.0	0.68	4.5	0.56	2.2
20.....	1.35	21	0.60	6.0	0.68	4.0	0.56	2.2
21.....	1.31	19.4	0.60	6.0	0.62	3.0	0.40	1.10
22.....	1.26	17.9	0.60	6.0	0.62	3.0	0.40	1.10
23.....	1.26	17.9	0.60	6.0	0.62	2.8	0.40	1.10
24.....	1.25	17.6	0.60	6.0	0.62	2.7	0.40	1.10
25.....	1.25	17.6	0.60	6.0	0.59	2.0	0.40	1.10
26.....	1.10	14.2	0.62	6.3	0.59	2.0	0.40	1.10
27.....	1.08	13.8	0.62	6.3	0.59	2.0	0.40	1.10
28.....	1.07	13.7	1.10	14.2	0.62	2.5	0.40	1.10
29.....	1.13	14.8	1.10	14.2	0.62	2.5	0.40	1.10
30.....	1.15	15.2	1.10	14.2	0.62	2.5	0.40	1.10
31.....			0.62	6.3			0.40	1.10

① No observations previous to April 8.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Oxarart Creek, at Wylie's Ranch, for 1912.—*Con.*

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	0.40	1.00	0.39	1.12	0.39	0.82	0.37	0.47
2.....	0.40	1.00	0.39	1.12	0.39	0.80	0.37	0.47
3.....	0.40	1.00	0.40	1.15	0.39	0.75	0.37	0.47
4.....	0.40	1.00	0.40	1.15	0.38	0.70	0.38	0.48
5.....	0.46	1.50	0.40	1.15	0.38	0.67	0.38	0.48
6.....	0.46	1.50	0.40	1.16	0.38	0.65	0.38	0.48
7.....	0.46	1.50	0.40	1.17	0.38	0.63	0.38	0.48
8.....	0.46	1.50	0.40	1.17	0.38	0.60	0.38	0.48
9.....	0.40	1.00	0.40	1.18	0.37	0.55	0.38	0.48
10.....	0.40	1.00	0.40	1.19	0.37	0.53	0.38	0.48
11.....	0.40	1.00	0.40	1.20	0.37	0.52	0.38	0.48
12.....	0.40	1.00	0.40	1.20	0.37	0.50	0.38	0.48
13.....	0.42	1.16	0.40	1.20	0.36	0.48	0.38	0.48
14.....	0.42	1.16	0.40	1.21	0.36	0.48	0.38	0.48
15.....	0.41	1.10	0.40	1.22	0.35	0.48	0.38	0.48
16.....	0.41	1.10	0.40	1.25	0.35	0.40	.....	.....
17.....	0.41	1.10	0.40	1.20	0.36	0.47	.....	.....
18.....	0.42	1.16	0.40	1.15	0.36	0.47	.....	.....
19.....	0.42	1.16	0.40	1.10	0.36	0.47	.....	.....
20.....	0.41	1.12	0.39	1.05	0.36	0.47	.....	.....
21.....	0.41	1.12	0.39	1.02	0.36	0.47	.....	.....
22.....	0.41	1.13	0.39	1.00	0.36	0.47	.....	.....
23.....	0.41	1.13	0.40	1.07	0.36	0.47	.....	.....
24.....	0.41	1.14	0.40	1.05	0.36	0.47	.....	.....
25.....	0.41	1.14	0.40	1.03	0.36	0.47	.....	.....
26.....	0.40	1.16	0.39	0.95	0.36	0.47	.....	.....
27.....	0.40	1.16	0.39	0.92	0.36	0.47	.....	.....
28.....	0.40	1.16	0.39	0.90	0.36	0.47	.....	.....
29.....	0.39	1.10	0.39	0.88	0.36	0.47	.....	.....
30.....	0.39	1.10	0.39	0.85	0.37	0.47	.....	.....
31.....	0.39	1.10	.....	.....	0.37	0.47	.....	.....

## MONTHLY DISCHARGE of Oxarart Creek at Wylie's Ranch, for 1912.

(Drainage area 73 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (8 to 30).....	537	13.7	86.7	1.18	1.01	3,955
May.....	14.2	5.7	7.97	0.109	0.13	490
June.....	7.0	2.0	4.65	0.064	0.07	277
July.....	2.5	1.10	1.88	0.026	0.03	116
August.....	1.50	1.00	1.14	0.016	0.02	70
September.....	1.25	0.85	1.10	0.015	0.02	66
October.....	0.82	0.40	0.536	0.007	0.01	33
November (1 to 15).....	0.48	0.47	0.411	0.006	0.003	12
The period.....	.....	.....	.....	.....	1.29	5,019

## SUCKER CREEK AT WHITCOMB AND ZEIGLER'S RANCH.

This station was established May 26, 1909, by H. R. Carscallen. In the spring of 1912, the gauge was moved about 200 feet upstream by M. H. French. It is now located on the N.W.  $\frac{1}{4}$  Sec. 24, Tp. 6, Rge. 26, W. 3rd Mer., about five miles south of Belanger post office and about thirty-two miles south of Maple Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is attached to a vertical post sunk in the bed of the stream and securely stayed to the left bank.

The channel is straight for 50 feet above and 25 feet below the station. Both banks are low, sparsely covered with brush, and will overflow at high stages. The bed of the stream is composed of sand and coarse gravel. The current is sluggish at the station but swift immediately below.

Discharge measurements are made with a meter at or near the gauge, by wading, and at very low stages a weir is used. It is difficult to make accurate gaugings during high water as the water overflows the banks.

During 1912, the gauge was read by Mrs. P. A. Zeigler.

# DISCHARGE MEASUREMENTS of Sucker Creek at Whitcomb and Zeigler's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 2.	M. H. French.	6.1	4.65	0.463	1.10	2.15①
April 6.	do	64.0	61.25	1.61	3.20	99.02
April 6.	do	69.0	95.5	2.28	3.70	218.08
April 8.	do	77.0	126.97	3.535	4.20	448.81
April 23.	do	9.30	16.9	1.073	2.00	18.13
May 22.	J. S. Wright.	20.3	18.18	0.19	1.70	3.53
June 13.	do	9.40	3.53	0.74	1.58	2.62
July 12.	do	9.50	3.34	0.67	1.65	2.23
Aug. 9.	do	9.0	2.82	0.34	1.57	0.95
Sept. 10.	do	8.7	4.50	0.50	1.64	2.23
Oct. 15.	do	9.1	5.13	0.58	1.68	3.00
Nov. 13.	do	9.0	5.00	0.58	1.69	2.88

① Channel filled with ice and snow. Cannot be used for curve.

# DAILY GAUGE-HEIGHT AND DISCHARGE of Sucker Creek at Whitcomb and Zeigler's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	1.07	2.00①	2.00	18.0	1.80	8.0	1.55	1.50
2.	1.10	2.15①	1.95	15.5	1.70	3.5	1.55	1.50
3.	1.07	2.00①	1.95	15.5	1.67	3.0	1.56	1.60
4.	1.07	2.00①	1.95	15.5	1.66	2.9	1.58	1.80
5.	4.46	600.00	1.95	15.5	1.65	2.8	1.61	2.2
6.	4.10	400.00	1.90	13.0	1.63	2.5	1.65	2.8
7.	3.70	220.00	2.04	20.0	1.62	2.3	1.66	2.9
8.	4.20	450.00	2.18	28.0	1.62	2.3	1.67	3.0
9.	4.50	615.00	2.08	22.0	1.61	2.2	1.67	3.0
10.	3.85	278.00	2.00	18.0	1.60	2.0	1.66	2.9
11.	3.55	175.00	1.98	17.0	1.59	1.90	1.65	2.8
12.	2.82	69.00	1.90	13.0	1.58	1.80	1.65	2.8
13.	2.30	35.00	1.81	8.5	1.58	1.80	1.67	3.0
14.	2.22	30.00	1.80	8.0	1.65	2.8	1.65	2.8
15.	2.18	28.00	1.80	8.0	1.76	6.2	1.63	2.4
16.	2.22	30.00	1.79	7.6	1.94	15.0	1.65	2.8
17.	2.18	28.00	1.70	3.5	1.81	8.5	1.64	2.6
18.	2.16	27.00	1.70	3.5	1.74	5.3	1.63	2.4
19.	2.12	24.00	1.70	3.5	1.68	3.2	1.62	2.3
20.	2.12	24.00	1.70	3.5	1.65	2.8	1.61	2.2
21.	2.07	22.00	1.70	3.5	1.64	2.6	1.62	2.3
22.	2.04	20.00	1.71	4.0	1.60	2.0	1.59	1.90
23.	2.00	18.00	1.70	3.5	1.58	1.80	1.59	1.90
24.	2.00	18.00	1.70	3.5	1.56	1.60	1.57	1.70
25.	2.00	18.00	1.70	3.5	1.55	1.50	1.54	1.40
26.	1.90	13.00	1.70	3.5	1.50	1.00	1.54	1.40
27.	1.92	14.00	1.72	4.4	1.49	0.90	1.54	1.40
28.	1.90	13.00	2.22	30.0	1.48	.80	1.53	1.30
29.	1.90	13.00	2.11	24.0	1.50	1.00	1.53	1.30
30.	2.00	18.00	1.89	12.5	1.53	1.30	1.51	1.10
31.			1.82	9.0			1.48	0.80

① Ice conditions April 1 to 4. Discharge estimated.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Sucker Creek at Whitcomb and Zeigler's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.48	0.80	1.64	2.60	1.69	3.35	1.69	3.35
2.....	1.57	1.70	1.67	3.05	1.68	3.20	1.69	3.35
3.....	1.60	2.00	1.69	3.35	1.67	3.05	1.69	3.35
4.....	1.65	2.75	1.71	3.95	1.68	3.20	1.69	3.35
5.....	1.67	3.05	1.71	3.95	1.68	3.20	1.70	3.50
6.....	1.65	2.75	1.68	3.20	1.68	3.20	1.70	3.50
7.....	1.63	2.40	1.68	3.20	1.68	3.20	1.70	3.50
8.....	1.59	1.90	1.65	2.75	1.68	3.20	1.69	3.35
9.....	1.57	1.70	1.65	2.75	1.71	3.95	1.69	3.35
10.....	1.55	1.50	1.64	2.60	1.71	3.95	1.69	3.35
11.....	1.54	1.40	1.64	2.60	1.69	3.35	1.69	3.35
12.....	1.56	1.60	1.64	2.60	1.69	3.35	1.69	3.35
13.....	1.57	1.70	1.66	2.90	1.69	3.35	1.69	3.35
14.....	1.57	1.70	1.66	2.90	1.68	3.20	1.69	3.35
15.....	1.57	1.70	1.69	3.35	1.68	3.20	1.69	3.35
16.....	1.69	3.35	1.68	3.20	1.68	3.20	.....	.....
17.....	1.70	3.50	1.67	3.05	1.68	3.20	.....	.....
18.....	1.71	3.95	1.67	3.05	1.71	3.95	.....	.....
19.....	1.70	3.50	1.69	3.35	1.71	3.95	.....	.....
20.....	1.67	3.05	1.69	3.35	1.72	4.40	.....	.....
21.....	1.64	2.60	1.69	3.35	1.72	4.40	.....	.....
22.....	1.63	2.45	1.71	3.95	1.70	3.50	.....	.....
23.....	1.62	2.30	1.72	4.40	1.70	3.50	.....	.....
24.....	1.61	2.15	1.70	3.50	1.70	3.50	.....	.....
25.....	1.64	2.60	1.70	3.50	1.70	3.50	.....	.....
26.....	1.63	2.45	1.69	3.35	1.70	3.50	.....	.....
27.....	1.68	3.20	1.69	3.35	1.70	3.50	.....	.....
28.....	1.69	3.35	1.70	3.50	1.70	3.50	.....	.....
29.....	1.70	3.50	1.69	3.35	1.70	3.50	.....	.....
30.....	1.69	3.35	1.69	3.35	1.70	3.50	.....	.....
31.....	1.67	3.05	.....	.....	1.70	3.50	.....	.....

## MONTHLY DISCHARGE of Sucker Creek at Whitcomb and Zeigler's Ranch, for 1912.

(Drainage area 33 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	615	2.00	106.94	3.29	3.67	6,363
May.....	30	3.5	11.5	0.349	0.40	707
June.....	15.0	0.80	3.18	.096	.11	189
July.....	3.0	.80	2.12	.064	.07	130
August.....	3.95	0.80	2.48	0.08	0.09	152
September.....	4.40	2.60	3.24	.10	.11	193
October.....	4.40	3.05	3.48	.10	.12	214
November (1-15).....	3.50	3.35	3.38	.10	.06	101
The period.....	.....	.....	.....	.....	4.63	8,049

## LONEPINE CREEK AT HEWITT'S RANCH.

This station was established July 17, 1909, by H. R. Carscallen. It is located on the N.W.  $\frac{1}{4}$  Sec. 27, Tp. 7, Rge. 26, W. 3rd Mer., about two miles west of the surveyed trail from Belanger post office to Maple Creek and about four miles west of Belanger.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post sunk in the bed of the stream at the right bank and securely stayed in place. The zero of the gauge (elev. 93.35) is referred to a permanent iron bench mark (assumed elev. 100.00), located on the right bank fifty feet west of the gauge.



The channel is straight for about 35 feet above and 45 feet below the station. The right bank is high and not liable to overflow; the left bank is comparatively low and will overflow at high stages of the stream. The surface of the ground on the left bank is very rough and broken. The bed of the stream is composed of sand and coarse gravel. The current is smooth and swift.

Discharge measurements are made near the gauge by wading and at very low stages a weir is used. The initial point for soundings is a square stake, driven close to the ground on the left bank and marked "I.P."

During 1912, the gauge was read by Walter Hewitt.

This station is below ditches constructed by A. P. McDonald and S. W. Hewitt and in the case of water being used in these ditches the records at the gauge do not give the complete discharge of the creek.

#### DISCHARGE MEASUREMENTS of Lonepine Creek near Hewitt's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 23.....	J. S. Wright.....	4.50	3.45	.69	1.78	2.38
June 13.....	do.....	3.80	2.00	.57	1.43	1.14
July 12.....	do.....	4.15	2.72	.20	1.61	0.531
Aug. 9.....	do.....	3.55	1.48	.52	1.30	0.768
Sept. 10.....	do.....	3.50	1.44	.53	1.29	0.762
Oct. 16.....	do.....	3.65	1.76	.54	1.37	.948
Nov. 13.....	do.....	3.75	1.92	.65	1.41	1.25

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Lonepine Creek, near Hewitt's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	③		1.86	2.71	1.85	2.67	1.25	0.65
2.....			1.86	2.71	1.67	1.97	1.25	0.65
3.....			1.87	2.75	1.67	1.97	1.25	0.65
4.....			1.87	2.75	1.71	2.12	1.19	0.53
5.....			1.94	3.03	1.71	2.12	1.20	0.55
6.....			2.01	3.32	1.71	2.12	1.20	0.55
7.....			2.01	3.32	1.67	1.97	1.30	0.77
8.....			1.98	3.20	1.65	1.89	1.34	0.87
9.....			2.01	3.32	1.67	1.97	2.30	4.60
10.....			1.99	3.24	1.67	1.97	1.85	2.67
11.....			1.98	3.20	1.66	1.93	1.85	2.67
12.....			1.97	3.16	1.66	1.93	1.61	1.74
13.....			1.95	3.07	1.65	1.89	1.85	2.67
14.....	1.95	3.07	1.80	2.47	1.65	1.89	1.86	2.70
15.....	2.01	3.32	1.79	2.43	1.74	2.23	1.86	2.70
16.....	1.95	3.07	1.74	2.23	1.74	2.23	1.86	2.70
17.....	2.05	3.49	1.74	2.23	1.73	2.20	1.86	2.70
18.....	2.05	3.49	1.74	2.23	1.62	1.78	1.86	2.70
19.....	2.01	3.32	1.72	2.16	1.62	1.78	1.86	2.70
20.....	2.01	3.32	1.72	2.16	1.61	1.74	1.40	1.02
21.....	2.01	3.32	1.71	2.12	1.55	1.52	1.40	1.02
22.....	1.95	3.07	1.79	2.43	1.55	1.52	1.40	1.02
23.....	1.90	2.87	1.80	2.47	1.37	0.94①	1.45	1.18
24.....	1.90	2.87	1.76	2.31	1.30	0.77	1.40	1.02
25.....	1.85	2.67	1.76	2.31	1.25	0.65	1.40	1.02
26.....	1.85	2.67	1.76	2.31	1.25	0.65	1.45	1.18
27.....	1.85	2.67	1.98	3.20	1.25	0.65	1.40	1.02
28.....	1.85	2.67	2.19	4.10	1.25	0.65	1.46	1.21
29.....	1.85	2.67	1.95	3.07	1.25	0.65	1.46	1.21
30.....	1.86	2.71	1.87	2.75	1.25	0.65	1.46	1.21
31.....			1.86	2.71			1.46	1.21

① Water diverted above for irrigation purposes on June 23.

No information available as to when ditch was closed.

② Ice conditions, April 1 to 14. Not sufficient data to compute discharge.

SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Lonepine Creek, near Hewitt's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.46	1.21	1.35	.89	1.34	.87	1.75	2.27
2.....	1.50	1.34	1.31	.79	1.34	.87	1.45	1.18
3.....	1.58	1.63	1.31	.79	1.34	.87	1.40	1.02
4.....	1.64	1.85	1.31	.79	1.34	.87	1.75	2.27
5.....	1.70	2.10	1.31	.79	1.34	.87	1.45	1.18
6.....	1.86	2.70	1.31	.79	1.34	.87	1.41	1.05
7.....	1.73	2.20	1.31	.79	1.34	.87	1.45	1.18
8.....	1.60	1.70	1.31	.79	1.34	.87	1.41	1.05
9.....	1.47	1.24	1.31	.79	1.50	1.34	1.35	.89
10.....	1.34	0.87	1.31	.79	1.45	1.18	1.35	.89
11.....	1.20	.55	1.31	.79	1.41	1.05	1.65	1.89
12.....	1.29	.75	1.31	.79	1.40	1.02	1.35	.89
13.....	1.29	.75	1.31	.79	1.40	1.02	1.35	.89
14.....	1.29	.75	1.31	.79	1.38	.97	1.35	.89
15.....	1.29	.75	1.50	1.34	1.38	.97	1.35	.89
16.....	2.06	3.53	1.35	.89	1.36	.92		
17.....	2.06	3.53	1.32	.82	1.35	.89		
18.....	2.06	3.53	1.31	.79	1.40	1.02		
19.....	2.05	3.49	1.50	1.34	1.39	.99		
20.....	1.55	1.52	1.35	.89	1.38	.97		
21.....	1.50	1.34	1.31	.79	1.38	.97		
22.....	1.52	1.41	1.35	.89	1.38	.97		
23.....	1.50	1.34	1.40	1.02	1.39	.99		
24.....	1.50	1.34	1.40	1.02	1.39	.99		
25.....	1.33	.84	1.35	.89	1.39	.99		
26.....	1.30	.77	1.35	.89	1.40	1.02		
27.....	1.50	1.34	1.34	.87	1.41	1.05		
28.....	1.25	.65	1.34	.87	1.41	1.05		
29.....	1.50	1.34	1.34	.87	1.41	1.05		
30.....	1.33	.84	1.34	.87	1.75	2.27		
31.....	1.33	.84			1.75	2.27		

## MONTHLY DISCHARGE of Lonepine Creek near Hewitt's Ranch, for 1912.

(Drainage area 8 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (14-30).....	3.49	2.67	3.02	0.38	0.24	102
May.....	4.10	2.12	2.76	0.34	0.39	170
June ①.....	2.67	0.65	1.63	0.20	0.22	97
July.....	4.60	0.53	1.58	0.197	0.25	97
August.....	3.53	0.55	1.55	0.194	0.22	95
September.....	1.34	0.79	0.87	0.11	0.12	52
October.....	2.27	0.87	1.06	0.13	0.15	65
November (1-15).....	2.27	0.89	1.23	0.15	0.08	37
The period.....					1.65	715

① Water diverted above for irrigation purposes on June 23. No information available as to when ditch was closed.

## BELANGER CREEK AT GARRISON'S RANCH.

This station was established June 12, 1909, by H. R. Carscallen. It is located on the S.W. ¼ Sec. 18, Tp. 7, Rge. 25, W. 3rd Mer., one hundred and fifty yards west of Garrison's ranch (Belanger P. O.), and about twenty-seven miles south of Maple Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is attached to a vertical post sunk in the bed of the stream on the left bank and securely stayed to the bank. The zero of the gauge (elev. 94.67) is referred to a permanent iron bench mark (assumed elev. 100.00), located on the left bank about 10 feet behind the gauge.

The channel is straight for 100 feet above and 125 feet below the station. Both banks are comparatively high but will overflow at times of extreme flood. The ground on the left bank is very rough and broken. Both banks are covered with low underbrush at the station and with large willow brush above and below. The bed of the stream is composed of sand and coarse gravel. The current is moderate at low stages.

Discharge measurements are made at the station by wading. No measurements can be made at extreme flood stage, as the banks overflow and make wading impossible. The initial point for soundings is a square stake driven close to the ground on the left bank and marked "I.P."

During 1912, the gauge was read by G. C. Garrison.

There are two small irrigation schemes under construction which will, when completed, divert water from Belanger Creek several miles above this station.

#### DISCHARGE MEASUREMENTS of Belanger Creek at Garrison's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 23.....	J. S. Wright .....	19.1	22.5	0.50	2.18	10.61
June 13.....	do .....	12.3	21.17	.40	2.11	8.49
July 12.....	do .....	12.2	20.98	.32	2.10	6.77
Aug. 9.....	do .....	12.3	19.84	.23	2.04	4.57
Sept. 10.....	do .....	11.8	18.89	.20	1.99	3.86
Oct. 15.....	do .....	12.3	18.89	.27	1.99	5.27
Nov. 13.....	do .....	12.2	18.69	.17	1.98	3.18

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Belanger Creek, at Garrison's Ranch, for, 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.08	10.0 ⑤	1.85	1.40	1.85	1.40	1.65	0.25
2.....	2.08	10.0 ⑤	1.85	1.40	1.75	0.70	1.85	1.40
3.....	4.87	16.0 ③	1.85	1.40	1.75	0.70	1.82	1.16
4.....	5.95	235. ③	1.85	1.40	1.65	.25	1.80	1.00
5.....	6.06	270. ③	1.85	1.40	1.65	.25	1.80	1.00
6.....	6.06	270. ③	1.85	1.40	1.65	.25	1.76	0.76
7.....	6.05	232. ③	2.07	5.67	1.55	.10	1.71	.46
8.....	6.05	232. ③	2.15	8.90	1.55	.10	1.71	.46
9.....	5.95	212. ③	2.15	8.90	1.55	.10	1.72	.52
10.....	4.15	166. ③	2.08	6.03	1.55	.10	1.72	.52
11.....	4.05	203.5	1.88	1.73	1.57	.12	1.73	.58
12.....	2.95	58.00	1.95	2.65	1.57	.12	1.80	1.00
13.....	2.35	19.00	1.95	2.65	1.84	1.32	1.71	0.46
14.....	2.08	6.03	1.95	2.65	1.96	2.84	1.71	.46
15.....	2.07	5.67	1.85	1.40	2.15	8.90	1.71	.46
16.....	2.08	6.03	1.85	1.40	2.05	4.95	1.71	.46
17.....	1.99	3.41	1.85	1.40	1.95	2.65	1.57	.12
18.....	1.99	3.41	1.85	1.40	1.88	1.73	1.57	.12
19.....	2.00	3.60	1.85	1.40	1.85	1.40	1.57	.12
20.....	2.00	3.60	1.85	1.40	1.85	1.40	1.68	.34
21.....	1.88	1.73	1.75	.70	1.81	1.08	1.68	.34
22.....	1.86	1.51	1.75	.70	1.77	0.82	1.75	.70
23.....	1.95	2.65	1.75	.70	1.77	.82	1.76	.76
24.....	1.95	2.65	1.65	.25	1.75	.70	1.77	.82
25.....	1.95	2.65	1.65	.25	1.75	.70	1.76	.76
26.....	1.95	2.65	1.65	.25	1.72	.52	1.76	.76
27.....	1.95	2.65	1.65	.25	1.72	.52	1.78	.88
28.....	1.95	2.65	1.65	.25	1.65	.25	1.78	.88
29.....	1.91	2.09	1.65	.25	1.65	.25	1.78	.88
30.....	1.95	2.65	1.85	1.40	1.65	.25	1.75	.70
31.....			1.85	1.40			1.76	.76

⑤ Ice conditions. Discharge estimated.

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Belanger Creek, at Garrison's Ranch, for 1912.

DAY.	August		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.87	1.62	1.99	3.41	1.98	3.22	1.97	3.03
2.....	1.87	1.62	1.99	3.41	1.98	3.22	1.97	3.03
3.....	1.88	1.73	1.97	3.03	1.98	3.22	1.97	3.03
4.....	1.88	1.73	1.97	3.03	1.99	3.41	1.97	3.03
5.....	1.89	1.84	1.98	3.22	1.99	3.41	1.98	3.22
6.....	1.89	1.84	1.97	3.03	1.99	3.41	1.98	3.22
7.....	1.90	1.95	1.97	3.03	2.00	3.60	1.97	3.03
8.....	1.92	1.23	2.00	3.60	2.00	3.60	1.98	3.22
9.....	2.04	4.68	2.00	3.60	2.00	3.60	1.98	3.22
10.....	1.90	1.95	1.99	3.41	2.01	3.87	1.99	3.41
11.....	1.90	1.95	2.01	3.87	2.00	3.60	1.99	3.41
12.....	1.78	0.88	2.01	3.87	2.00	3.60	2.00	3.60
13.....	1.77	.82	2.01	3.87	1.98	3.22	1.98	3.22
14.....	1.78	.88	2.00	3.60	1.98	3.22	2.00	3.60
15.....	1.77	.82	2.00	3.60	1.99	3.41	2.00	3.60
16.....	1.77	.82	2.00	3.60	1.99	3.41	.....	.....
17.....	1.78	.88	1.99	3.41	1.99	3.41	.....	.....
18.....	1.78	.88	1.98	3.41	1.99	3.41	.....	.....
19.....	1.78	.88	2.00	3.60	1.99	3.41	.....	.....
20.....	1.77	.82	2.00	3.60	1.99	3.41	.....	.....
21.....	1.77	.82	2.01	3.87	1.99	3.41	.....	.....
22.....	1.87	1.62	2.01	3.87	1.99	3.41	.....	.....
23.....	1.89	1.84	2.01	3.87	1.99	3.41	.....	.....
24.....	2.00	3.60	1.99	3.41	1.98	3.22	.....	.....
25.....	2.00	3.60	1.99	3.41	1.98	3.22	.....	.....
26.....	1.99	3.41	1.99	3.41	1.98	3.22	.....	.....
27.....	1.99	3.41	2.00	3.60	1.98	3.22	.....	.....
28.....	2.00	3.60	1.99	3.41	1.98	3.22	.....	.....
29.....	2.00	3.60	1.99	3.41	1.98	3.22	.....	.....
30.....	2.00	3.60	1.98	3.22	1.97	3.03	.....	.....
31.....	2.00	3.60	.....	.....	1.97	3.03	.....	.....

## MONTHLY DISCHARGE of Belanger Creek, at Garrison's Ranch, for 1912.

(Drainage area 43 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	270.	1.51	66.3	1.54	1.72	3,945.0
May.....	8.90	0.25	2.01	0.047	0.054	124.0
June.....	8.90	0.10	1.18	.027	.030	70.0
July.....	1.40	0.12	0.64	.015	.017	39.0
August.....	4.68	0.82	2.02	.047	.054	124.0
September.....	3.87	3.03	3.49	.081	.090	208.0
October.....	3.87	3.03	3.36	.078	.090	207.0
November (1-15).....	3.60	3.03	3.26	.076	.04	97.0
The period.....	.....	.....	.....	.....	2.095	4,814.0

## BELANGER CREEK AT OAKES' RANCH.

This station was established on March 31, 1912, by M. H. French. It is situated on the S.W.  $\frac{1}{4}$  Sec. 30, Tp. 6, Rge. 25, W. 3rd Mer., at Oakes' Ranch and about 35 miles south of the town of Maple Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is sunk in the bed of the stream on the left bank and securely stayed to the bank.

The channel is straight for about 50 feet above and below the gauge. The left bank is heavily wooded. Both banks are low and liable to overflow during floods. The bed of the stream is composed of sand and gravel and is liable to shift.

Discharge measurements are made by wading at a point about 40 feet above the gauge.

J. E. Oakes, who was reading the rod, moved into Maple Creek on May 16. During the summer the gauge was read at irregular intervals by E. C. R. Harris.

Water is diverted from this stream by Oakes' Ditch at a short distance above the station. No water was diverted during 1912.

### DISCHARGE MEASUREMENTS of Belanger Creek at Oakes' Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 30	M. H. French	7.0	7.06	0.56	.....	3.93①
April 1	do	7.5	7.83	0.63	1.30	4.93①
April 3	do	14.5	16.10	0.51	1.65	8.18①
April 5	do	228.3	240.3	1.72	3.65	416.59
April 7	do	267.0	383.98	0.70	3.32	269.76
April 22	do	15.3	10.45	3.26	0.94	30.41
April 23	do	15.6	10.34	2.87	0.92	29.64
May 22	J. S. Wright	10.0	10.65	1.21	0.64	12.91
June 13	do	11.8	10.31	1.10	0.52	11.37
July 12	do	11.7	11.89	0.88	0.54	10.41
Aug. 9	do	10.8	8.12	0.47	0.32	3.82
Sept. 10	do	12.4	8.73	0.52	0.54	4.52
Oct. 15	do	11.9	9.49	0.64	0.55	6.11
Nov. 13	do	11.9	9.6	0.68	0.53	6.55

① Ice conditions.

### DAILY GAUGE-HEIGHT AND DISCHARGE of Belanger Creek, at Oakes' Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	1.80	15.00①	0.76	16.70	.....	.....	0.44	6.93
2	1.80	15.00①	.73	15.69	.....	.....	.44	6.93
3	2.40	25.00①	.75	16.35	.....	.....	.44	6.93
4	3.70	350.00①	.75	16.35	.....	.....	.44	6.93
5	3.65	416.59	.85	19.75	.....	.....	.47	7.78
6	3.55	365.0	.90	21.45	.....	.....	.50	8.60
7	3.52	350.0	1.18	30.97	.....	.....	.49	8.32
8	3.50	340.0	1.67	49.5	.....	.....	.51	8.89
9	3.42	319.0	1.42	39.2	.....	.....	.54	9.76
10	3.25	248.5	1.03	25.87	.....	.....	.52	9.18
11	3.20	234	0.95	23.15	.....	.....	.52	9.18
12	2.65	128.5	.85	19.75	.....	.....	.54	9.76
13	2.01	67.7	.75	16.35	0.52	9.18	.55	10.05
14	1.78	55	.70	14.7	.....	.....	.52	9.18
15	1.75	53.5	.70	14.7	.....	.....	.51	8.89
16	1.85	58.5	.70	14.7	.....	.....	.50	8.60
17	1.75	53.5	.....	①	.....	①	.50	8.60
18	1.48	41.3	.....	.....	0.59	11.25	.50	8.60
19	1.27	34.05	.....	.....	.54	9.76	.50	8.60
20	1.15	29.95	.....	.....	.51	8.89	.50	8.60
21	1.10	28.25	.....	.....	.51	8.89	.50	8.60
22	0.95	23.15	.....	.....	.50	8.60	.50	8.60
23	.95	23.15	.....	.....	.48	8.04	.50	8.60
24	.85	19.75	.....	.....	.47	7.76	.50	8.60
25	.84	19.40	.....	.....	.46	7.48	.50	8.60
26	.85	19.75	.....	.....	.45	7.20	.50	8.60
27	.78	17.35	.....	.....	.44	6.93	.50	8.60
28	.75	16.35	.....	.....	.44	6.93	.50	8.60
29	.68	14.02	.....	.....	.44	6.93	.50	8.60
30	.....	.....	.....	.....	.44	6.93	.50	8.60
31	.....	.....	.....	.....	.....	.....	.50	8.60

① Ice conditions. Discharge estimated.

② No observer.

## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Belanger Creek, at Oakes' Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....		①.....			0.59	11.25	0.51	8.89
2.....								
3.....							0.50	8.60
4.....					0.60	11.55		
5.....								
6.....					0.60	11.55		
7.....				②.....				
8.....			0.53	9.47			0.50	8.60
9.....	0.32	3.80		③.....				
10.....			0.54	9.76	0.63	12.48	0.50	8.60
11.....								
12.....								
13.....			0.55	10.05			0.53	9.47
14.....					0.60	11.55		
15.....			0.55	10.05	0.55	10.05	0.50	8.60
16.....					0.56	10.35		
17.....					0.57	10.65		
18.....								
19.....								
20.....					0.59	11.25		
21.....			0.56	10.35	0.58	10.95		
22.....								
23.....					0.57	10.65		
24.....			0.57	10.65	0.57	10.65		
25.....					0.56	10.35		
26.....			0.58	10.95	0.56	10.35		
27.....					0.55	10.05		
28.....								
29.....			0.59	11.25				
30.....					0.53	9.47		
31.....								

① No observer.

② Observer could not visit rod every day.

## MONTHLY DISCHARGE of Belanger Creek, at Oakes' Ranch, for 1912.

(Drainage area 64 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	416.59	14.02	113.18	1.77	1.98	6,736.0
May.....	49.5	14.7	22.2	0.347	0.21	704.0
June.....	11.25	6.93	8.18	0.128	0.067	227.0
July.....	10.05	6.93	8.54	0.133	0.153	525.0
August.....					0.048	160.0 ①
September.....	11.25	9.47	10.32	0.161	0.048	164.0
October.....	12.48	9.47	10.80	0.169	0.10	343.0
November (1-15).....	9.47	8.60	8.79	0.137	0.031	104.0
The period.....					2.637	8,963.0

NOTE.—This table is estimated from gauge heights for partial months.

As will be seen by referring to the table of daily discharges, the records are very incomplete and the monthly discharges are therefore only very approximate.

① Estimated from records on streams in this vicinity.

## DAVIS CREEK AT DRURY'S RANCH.

This station was established May 24, 1909, by H. R. Carscallen. It is located on N. E.  $\frac{1}{4}$  Sec. 29, Tp. 6, Rge. 25, W. 3rd Mer., about five miles southeast of Belanger post office, and about one-half mile from the mouth of the creek.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post in the bed of the stream on the right bank and securely stayed to the bank. The zero of the gauge (elev. 95.18) is referred to a permanent iron bench mark (assumed elev. 100.00), about 25 feet west of the gauge.

The channel is straight for 150 feet above and 200 feet below the station. The right bank is comparatively high and will not overflow except in cases of extreme flood; the left bank is low and will overflow at high-water stages of the stream. Both banks are covered with brush. The bed of the stream is composed of sand and coarse gravel and there may be a slight sub-surface flow at this point. The current is swift.

Discharge measurements are made at or near the gauge by wading. Owing to the left bank being low, high-water measurements cannot be made. Considerable annoyance is experienced by the construction of dams below the gauge by beavers.

During 1912, the gauge was read by E. C. R. Harris.

There are one or two proposed irrigation schemes on the head-waters of this stream, but as yet there has been no diversion of water.

#### DISCHARGE MEASUREMENTS of Davis Creek at Drury's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 1.....	M. H. French.....	4.50	1.20	0.68	0.55	0.823
April 7.....	do .....	51	90.9	4.33	4.23	393.87
April 23.....	do .....	14.2	12.8	3.24	1.34	41.4
May 21.....	J. S. Wright.....	13.00	6.0	1.59	0.93	9.55
June 12.....	do .....	12.00	3.40	0.78	0.72	2.67
July 11.....	do .....	11.3	3.20	0.70	0.68	2.23
Aug. 8.....	do .....	9.3	2.19	0.79	0.66	1.61
Sept. 9.....	do .....	6.3	1.41	0.36	0.57	0.51
Oct. 14.....	do .....	8.0	1.55	0.36	0.60	0.56
Nov. 12.....	do .....	11.2	3.61	0.78	0.75	2.81

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Davis Creek, at Drury's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	0.55	.75	1.38	41.4	0.96	11.0	0.66	1.60
2.....	0.55	.75	1.29	34.2	.92	9.0	.65	1.5
3.....	.64	1.40	1.22	28.6	.87	6.95	.65	1.5
4.....	.69	1.90	1.20	27.0	.84	5.9	.65	1.5
5.....	3.88	343.20	1.17	24.9	.82	5.2	.65	1.5
6.....	3.95	353.00	1.23	29.4	.80	4.5	.66	1.6
7.....	4.23	393.20	1.41	43.9	.78	4.0	.66	1.6
8.....	4.85	486.00	1.78	79.0	.76	3.5	.65	1.5
9.....	5.08	522.80	1.59	60.1	.74	3.0	.64	1.4
10.....	5.12	529.20	1.49	51.1	.74	3.0	.64	1.4
11.....	4.60	446.00	1.20	27.0	.74	3.0	.68	1.8
12.....	3.22	250.80	1.10	20.0	.74	3.0	.66	1.6
13.....	1.92	93.00	1.06	17.2	.72	2.5	.68	1.8
14.....	①		1.04	15.8	.76	3.5	.70	2.0
15.....			1.03	15.1	1.20	27.0	.69	1.9
16.....			1.01	13.7	1.42	44.8	.68	1.8
17.....			1.00	13.0	1.39	42.2	.68	1.8
18.....			.98	12.0	.90	8.0	.67	1.7
19.....			.96	11.0	.83	5.55	.67	1.7
20.....			.94	10.0	.79	4.25	.67	1.7
21.....			.93	9.5	.74	3.0	.67	1.7
22.....			.92	9.0	.72	2.5	.67	1.7
23.....			.94	10.0	.70	2.0	.67	1.7
24.....			.93	9.5	.69	1.9	.67	1.7
25.....			.91	8.5	.69	1.9	.67	1.7
26.....			.91	8.5	.69	1.9	.67	1.7
27.....			1.04	15.8	.68	1.8	.67	1.7
28.....			1.94	95.0	.67	1.7	.67	1.7
29.....			1.40	43.0	.67	1.7	.67	1.7
30.....			1.18	25.6	.66	1.6	.66	1.6
31.....			1.07	17.9			.65	1.5

① No observer April 14 to 30. See monthly discharge sheet.

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Davis Creek, at Drury's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	.65	1 50	.58	.90	.52	.60	.72	2 50
2.....	.65	1 5	.56	.8	.52	.6	.71	2 25
3.....	.65	1 5	.56	.8	.52	.6	.71	2 25
4.....	.65	1 5	.56	.8	.53	.65	.70	2
5.....	.65	1 5	.56	.8	.54	.70	.70	2
6.....	.65	1 5	.56	.8	.54	.7	.69	1 9
7.....	.65	1 5	.56	.8	.54	.7	.72	2 5
8.....	.66	1 6	.55	.75	.54	.7	.74	3
9.....	.65	1 5	.57	.85	.55	.75	.74	3
10.....	.65	1 5	.57	.85	.55	.75	.75	3 25
11.....	.65	1 5	.56	.8	.56	.8	.75	3 25
12.....	.65	1 5	.56	.8	.56	.8	.75	3 25
13.....	.65	1 5	.56	.8	.61	1 1	.76	3 5
14.....	.65	1 5	.56	.8	.60	1 0	.76	3 5
15.....	.65	1 5	.56	.8	.62	1 2	.77	3 75
16.....	.64	1 4	.55	.75	.64	1 4	.77	3 75
17.....	.64	1 4	.55	.75	.65	1 5	.....	.....
18.....	.64	1 4	.55	.75	.66	1 6	.....	.....
19.....	.65	1 5	.55	.75	.72	2 5	.....	.....
20.....	.64	1 4	.55	.75	.74	3 0	.....	.....
21.....	.64	1 4	.55	.75	.75	3 25	.....	.....
22.....	.64	1 4	.54	.70	.75	3 25	.....	.....
23.....	.64	1 4	.52	.6	.74	3 0	.....	.....
24.....	.63	1 3	.52	.6	.73	2 75	.....	.....
25.....	.63	1 3	.52	.6	.74	3 0	.....	.....
26.....	.63	1 3	.52	.6	.76	3 5	.....	.....
27.....	.63	1 3	.52	.6	.78	4 0	.....	.....
28.....	.62	1 2	.52	.6	.79	4 25	.....	.....
29.....	.62	1 2	.52	.6	.77	3 75	.....	.....
30.....	.62	1 2	.52	.6	.76	3 5	.....	.....
31.....	.59	.95	.....	.....	.74	3 0	.....	.....

## MONTHLY DISCHARGE of Davis Creek, at Drury's Ranch, for 1912.

(Drainage area 45 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	529.20	0.75	142.6	3.17	3.54	8,485.00 ①
May.....	79.00	8.50	26.66	0.59	0.68	1,639.00
June.....	44.80	1.60	6.99	0.15	0.17	417.00
July.....	2.00	1.40	1.66	0.04	0.05	102.00
August.....	1.60	0.95	1.41	0.03	0.04	87.00
September.....	0.90	0.60	0.74	0.02	0.02	44.00
October.....	4.25	0.60	1.90	0.04	0.05	117.00
November (1-15).....	3.75	1.90	2.85	0.06	0.04	91.00
The period.....					4.59	10,982.00

① No observer April 14 to 30. Discharge estimated.

## FAIRWELL CREEK AT DRURY'S RANCH.

This station was established June 10, 1909, by H. R. Carscallen. It is located about eleven miles south east of Belanger post office, at Drury's ranch, on N. W.  $\frac{1}{4}$  Sec. 30, Tp. 6, Rge. 24, W. 3rd Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post sunk in the left bank. The zero of the gauge (elev. 95.13) is referred to a permanent iron bench mark (assumed elev. 100.00), about 20 feet southeast of the gauge.



The channel is straight for 75 feet upstream, but curves slightly to the right for 50 feet downstream. Both banks are comparatively low and will overflow at high stages of the stream. The banks are covered with brush above and below the station. The bed of the stream is composed of sand and coarse gravel. The current is sluggish at the station, but is swift a short distance below.

Discharge measurements are made by wading a short distance below the gauge. Owing to the low banks, high water measurements cannot be made. The initial point for soundings is a square stake driven close to the ground at the left bank and marked "I.P."

During 1912, the gauge was read by Ivan A. F. Harris.

There are a number of proposed irrigation schemes which will take their supply from this stream at points above the gauging station.

#### DISCHARGE MEASUREMENTS of Fairwell Creek at Drury's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 21.....	J. S. Wright.....	61.5	78.07	0.16	3.00	12.13
June 12.....	do.....	19.0	20.79	0.51	2.85	10.64
July 11.....	do.....	18.7	10.81	0.57	2.61	6.13
Aug. 7.....	do.....	9.0	3.15	1.10	2.54	3.46
Sept. 9.....	do.....	12.8	6.27	0.24	2.70①	1.51①
Oct. 14.....	do.....	11.2	2.64	1.35	2.57	3.57
Nov. 12.....	do.....	11.2	9.84	0.67	2.73	6.61

① Gauge height affected by heavier dam.

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Fairwell Creek, at Drury's Ranch, for 1912.

DA.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.49	①	3.50	22.25				
2.....	1.55	①	3.45	21.30				
3.....	1.55	①	3.35	19.40				
4.....	1.59	①	3.31	18.64				
5.....	2.15	①	3.29	18.26				
6.....	2.85	①	3.31	18.64				
7.....	3.12	①	3.35	19.40				
8.....	4.83	①	3.55	23.20				
9.....	5.42	786 ①	3.52	22.63				
10.....	5.59	814	3.39	20.16				
11.....	5.20	704	3.25	17.5			2.61	6.15②
12.....	4.75	578	3.25	17.5	2.85	④ 10.00	2.60	5.90
13.....	4.15	412	3.25	17.5			2.59	5.80
14.....	3.97	352	3.23	17.12			2.59	5.70
15.....	4.15	384	3.21	16.74			2.59	5.65
16.....	4.17	364	3.17	15.98			2.60	5.65
17.....	4.05	334	3.11	14.84			2.59	5.55
18.....	4.10	332	3.07	14.08			2.59	5.50
19.....	3.95	280	3.05	13.70			2.59	5.40
20.....	3.83	238	3.02	13.13			2.60	5.40
21.....	3.79	212	3.00	12.75			2.61	5.40
22.....	3.69	174	2.97	12.18			2.61	5.30
23.....	3.67	152	2.97	12.18			2.61	5.20
24.....	3.65	138	3.03	13.32			2.59	5.05
25.....	3.65	124	③				2.61	5.05
26.....	3.62	115					2.61	5.00
27.....	3.59	80					2.60	4.90
28.....	3.55	56					2.59	4.75
29.....	3.53	36					2.57	4.55
30.....	3.53	24					2.57	4.50
31.....							2.57	4.35

① Ice conditions. Not sufficient data to compute discharge.

② Shifting conditions April 9 to 30th.

③ No records May 25th to July 11.

④ Shifting conditions July 12th to August 7th.

⑤ Taken by District Hydrographer.

## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Fairwell Creek, at Drury's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.57	4.25	2.55	3.68	2.54	3.54	2.60	4.40
2.....	2.60	4.30	2.60	4.40	2.53	3.40	2.62	4.72
3.....	2.61	4.25	2.59	4.26	2.53	3.40	2.66	5.38
4.....	2.61	4.20	2.61	4.56	2.54	3.54	2.70	6.10
5.....	2.61	4.05	2.59	4.26	2.54	3.54	2.70	6.10
6.....	2.55	3.80	2.57	3.97	2.55	3.68	2.70	6.10
7.....	2.54	3.54	2.56	3.82	2.56	3.82	2.72	6.46
8.....	2.54	3.54	2.52	3.27	2.56①	3.82	2.72	6.46
9.....	2.53	3.40	2.70	6.10	2.56①	3.82	2.72	6.46
10.....	2.54	3.54	2.58	4.11	2.56①	3.82	2.72	6.46
11.....	2.54	3.54	2.58	4.11	2.57①	3.97	2.73	6.64
12.....	2.54	3.54	2.60	4.40	2.57①	3.97	2.73	6.64
13.....	2.54	3.54	2.60	4.40	2.57①	3.97	2.74	6.81
14.....	2.53	3.40	2.61	4.56	2.57	3.97	2.75	7.00
15.....	2.52	3.27	2.61	4.56	2.57	3.97	2.67	5.56
16.....	2.53	3.40	2.59	4.26	2.57	3.97	.....	.....
17.....	2.60	4.40	2.58	4.11	2.58	4.11	.....	.....
18.....	2.64	5.04	2.60	4.40	2.57	3.97	.....	.....
19.....	2.65	5.20	2.62	4.72	2.56	3.28	.....	.....
20.....	2.64	5.04	2.62	4.72	2.57	3.97	.....	.....
21.....	2.65	5.20	2.60	4.40	2.57	3.97	.....	.....
22.....	2.80	7.90	2.60	4.40	2.58	4.11	.....	.....
23.....	2.80	7.90	2.60	4.40	2.58	4.11	.....	.....
24.....	2.80	7.90	2.59	4.26	2.58	4.11	.....	.....
25.....	2.85	8.85	2.58	4.11	2.57	3.97	.....	.....
26.....	2.87	9.23	2.57	3.97	2.57	3.97	.....	.....
27.....	2.79	7.71①	2.57	3.97	2.57	3.97	.....	.....
28.....	2.71	6.29①	2.55	3.68	2.57	3.97	.....	.....
29.....	2.64	5.04	2.55	3.68	2.57	3.97	.....	.....
30.....	2.53	3.40	2.55	3.68	2.58	4.11	.....	.....
31.....	2.55	3.68	.....	.....	2.59	4.26	.....	.....

① Gauge heights interpolated owing to beaver dams.

## MONTHLY DISCHARGE of Fairwell Creek, at Drury's Ranch, for 1912.

(Drainage area 125 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (9-30).....	814.	24.	313.14	2.50	2.05	13,664.
May.....	23.2	12.18	17.18	0.137	0.158	1,052.
June.....	.....	.....	8.00	.064	.070	476.
July.....	6.15	4.35	5.26	.042	.049	323.
August.....	9.23	3.27	4.91	.039	.045	302.
September.....	4.72	1.51	4.09	.033	.037	243.
October.....	4.26	3.28	3.87	.031	.036	238.
November (1-15).....	7.00	4.40	12.17	.097	.051	373.
The period.....	.....	.....	.....	.....	2.50	16,671.

NOTE.—No records, May 25 to July 11. Discharge estimated by comparison with creeks in the vicinity.

## FRENCHMAN RIVER AT GORDON'S RANCH.

This station was established in November, 1911, by G. H. Whyte, but was destroyed during the spring floods of 1912, and was re-established in September, 1912, by M. H. French, and J. S. Wright. It is situated about three miles below the mouth of Fairwell Creek and about six miles above the mouth of the North Branch of Frenchman River. It is located on the N. W.  $\frac{1}{4}$  Sec 16, Tp. 6, Rge. 24, W. 3rd Mer.

The gauge, which is a plain staff graduated in feet and hundredths, is attached vertically to a post sunk in the right bank of the stream. The zero of the gauge (elev. 85.96), is referred to a permanent iron bench mark (assumed elev. 100.00), sunk in the right bank about 80 feet west of the gauge.

The river flows in one channel at all stages, which is straight for about 100 feet above and below the station. Both banks are slightly wooded, high and not liable to overflow except in extreme flood stages of the stream. The bed of the stream is composed of clay and gravel and is not liable to shift.

Discharge measurements are made during high water by means of a cable car, tagged wire, and stay wire. Beaver dams above and below the station affect discharge measurements when the stream is not in flood. During low water, discharge measurements are made by wading at a point about 200 yards below the gauge.

No observations of the gauge were obtained during 1912.

#### DISCHARGE MEASUREMENTS of Frenchman River at Gordon's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 11.	J. S. Wright	23 0	17 48	1 12	2.19	20.90
July 12	do	22 8	23 49	0 88	2.18	20.68
Aug. 17	do	22.3	19.53	0 59	1.95	11.43
Sept. 9	do	22.3	18.55	0 36	2.22	6.63
Oct. 12	do	22 4	19.00	0 42	1.23	7.95
Nov. 12	do	23 1	21 00	0 67	1.42	14.34

Note.—Beaver dams affected gauge heights during whole season.

#### BLACKTAIL CREEK AT GARISSERE'S RANCH. (S.-W. 31-6-23-3)

For description of this station see 1911 Report.

The gauge at this station was washed out during the spring floods of 1912, and as no observer could be obtained it was decided to abandon this station and therefore the gauge was not replaced. Miscellaneous measurements were made at this station during 1912.

#### DISCHARGE MEASUREMENTS of Blacktail Creek at Garissere's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 20	J. S. Wright	9.1	8 40	0.12		1.02
June 11.	do	3.0	0.66	0.39		0.26
July 10	do					Nil ①
Aug. 7	do					Nil ②
Sept. 7	do					Nil ②
Sept. 30	do					Nil ②

① Water standing in pools.

② Creek dry.

#### ROSE CREEK AT EAST END.

This station was established on May 1, 1911, by G. H. Whyte. It is located on the N. E.  $\frac{1}{4}$  Sec. 26, Tp. 7, Rge. 22, W. 3rd Mer., at East End post office.

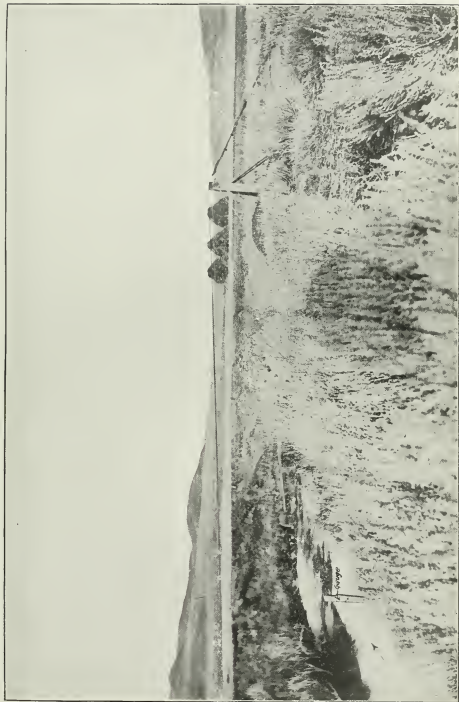
The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the left bank. The zero of the gauge (elev. 91.09) is referred to a permanent iron bench mark (assumed elev. 100.00), located on the left bank about 30 feet downstream from the gauge.

The channel of the stream is straight for about 40 feet above and 75 feet below the station. The right bank is low and liable to overflow, but the left is high and not liable to overflow. The bed of the stream is composed of sand which has a small amount of vegetation and shifts slightly.

Discharge measurements are made during low water with a weir at a point 100 feet below the gauge, but at high water stages with a current meter by wading at the gauge. The initial point for soundings is a stake on the left bank.

During 1912, the gauge was read by B. E. Rose, postmaster at East End.

B. E. Rose has an irrigation ditch which diverts water from Rose Lake, the source of Rose Creek. No water was diverted by this ditch during 1912.



Gauging Station on Frenchman River at Gordon's Ranch. Taken by J. S. Wright.



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## DISCHARGE MEASUREMENTS of Rose Creek at East End, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 23.	G. H. Whyte	4 3	2 14	1 495	1 275	3 20
June 4	J. S. Wright	1 6	0 68	0 78	1 01	0 53
June 25.	do				0 86	0 246①
July 26.	do				.73	0 172①
Aug. 22.	do				.71	0 182①
Sept. 23.	do				.86	0 481①
Oct. 29.	do				.76	0 312①
Nov. 9	do				.83	0 55 ①

① Weir measurement.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Rose Creek, at East End, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.			1 12	1 03	1 00	0 50	0 92	0 33
2.			1 20	1 73	.94	.36	.88	.28
3.			1 13	1 10	.90	.30	.85	.24
4.	3 93	①	1 15	1 23	.96	.40	.84	.23
5.	2 60	①	1 12	1 03	.99	.48	.84	.23
6.	2 46	①	1 14	1 17	.98	.45	.89	.29
7.	1 83	①	1 16	1 33	.97	.42	.86	.25
8.	2 13	23 56	1 13	1 10	.95	.38	.97	.42
9.	2 28	27 11	1 16	1 33	.98	.45	.94	.36
10.	2 26	26 64	1 13	1 10	1 00	.50	.91	.32
11.	1 86	17 13	1 12	1 03	.90	.30	.88	.28
12.	1 57	10 23	1 12	1 03	.89	.29	.84	.23
13.	1 53	9 27	1 12	1 03	.93	.35	.78	.19
14.	1 56	9 99	1 12	1 03	1 33	4 51	.99	.48
15.	1 48	8 09	1 02	.57	1 38	5 71	.97	.42
16.	1 40	6 18	.94	.36	1 16	1 33	.81	.21
17.	1 34	4 75	.92	.33	1 10	.90	.80	.20
18.	1 28	3 32	.94	.36	.95	.38	.80	.20
19.	1 28	3 32	.94	.36	.93	.35	.76	.18
20.	1 28	3 32	.96	.40	.88	.28	.78	.19
21.	1 28	3 32	.93	.35	.90	.30	.74	.19
22.	1 28	3 32	1 06	.72	.88	.28	.73	.18
23.	1 26	2 85	1 14	1 17	.85	.24	.72	.17
24.	1 22	2 09	.96	.40	.82	.22	.73	.18
25.	1 20	1 73	.90	.30	.80	.20	.73	.18
26.	1 20	1 73	.96	.40	.80	.20	.72	.17 ①
27.	1 20	1 73	1 47	7 85	.80	.20	.71	.16
28.	1 20	1 73	1 32	4 28	.76	.18	.70	.18
29.	1 20	1 73	1 16	1 33	.82	.22	.70	.19
30.	1 20	1 73	1 13	1 10	.83	.23	.69	.19
31.			1 10	.90			.72	.20

① Ice conditions. Not sufficient data to compute discharge.

② Shifting conditions July 26th to October 29th.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Rose Creek, at East End, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	.68	.18①	.75	.26	.75	.28	.76	.31
2.....	.84	.26	.78	.34	.73	.26	.75	.28
3.....	.87	.31	.76	.28	.73	.26	.75	.28
4.....	.83	.25	.83	.50	.73	.26	.76	.31
5.....	.80	.23	.88	.67	.73	.26	.76	.31
6.....	.76	.19	.83	.49	.73	.26	.77	.34
7.....	.76	.20	.76	.26	.73	.26	.78	.37
8.....	.74	.18	.74	.20	.95	.89	.78	.37
9.....	.70	.17	.74	.20	.91	.70	.81	.48
10.....	.73	.18	.74	.20	.95	.89	.79	.40
11.....	.70	.17	.73	.17	.93	.79	.75	.28
12.....	.72	.17	.72	.14	.83	.45	.75	.28
13.....	.72	.18	.78	.29	.79	.36	.76	.31
14.....	.72	.18	.94	.81	.78	.34	.76	.31
15.....	.73	.19	.82	.40	.77	.33	.75	.28
16.....	.93	.43	.80	.33	.77	.33		
17.....	.80	.24	.76	.21	.81	.41		
18.....	.90	.38	.76	.21	.89	.65		
19.....	.98	.63	.84	.44	.93	.88		
20.....	.83	.27	.82	.36	.88	.66		
21.....	.76	.21	.82	.36	.89	.79		
22.....	.72	.18	.86	.49	.81	.41		
23.....	.72	.20	.84	.58	.85	.52		
24.....	.72	.20	.79	.33	.85	.52		
25.....	.72	.20	.78	.33	.81	.42		
26.....	.73	.22	.77	.30	.81	.42		
27.....	.85	.61	.77	.30	.81	.42		
28.....	.83	.53	.77	.30	.81	.42		
29.....	.96	1.07	.76	.29	.76	.31		
30.....	.83	.52	.76	.29	.76	.31①		
31.....	.77	.32			.76	.31		

① Shifting conditions from July 26 to Oct. 29th.

## MONTHLY DISCHARGE of Rose Creek, at East End, for 1912.

(Drainage area 13 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (3-30).....	27.11	1.73	7.60	0.585	0.500	346.0
May.....	7.85	0.30	1.21	0.093	.11	74.0
June.....	5.71	0.18	0.70	0.054	0.06	42.0
July.....	0.48	0.16	0.24	0.018	0.02	15.0
August.....	1.07	0.17	0.30	0.023	0.03	18.0
September.....	0.67	0.14	0.34	0.026	0.03	20.0
October.....	0.89	0.26	0.47	0.036	0.04	29.0
November (1-15).....	0.48	0.28	0.33	0.026	0.02	10.0
The period.....					0.810	554.0

## SESSIONAL PAPER No. 25d

## FRANK CROSS' DITCH NEAR EAST END.

This station was established September 9, 1911, by G. R. Elliott, on the irrigation ditch of Frank Cross which diverts water from the north branch of Frenchman River on the N. W.  $\frac{1}{4}$  Sec. 15, Tp. 7, Rge. 22, W. 3rd Mer.

The gauge is located on the N.-W.  $\frac{1}{4}$  Sec. 15, and about 130 feet from the intake of the ditch. It is a plain staff 4" x 1" graduated to feet and inches and is on the left side of the sluice flume. The zero of the gauge (elev. 94.45) is referred to a nut on N. W. corner of a bridge at that point (assumed elev. 100.00).

The station is 5 feet from the end of the sluice flume of the ditch, which has a bottom width of 2.85 feet with sides 1.8 feet in height.

During 1912 the gauge was read by Frank Cross.

## DISCHARGE MEASUREMENTS of F. Cross' Ditch, near East End, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 10.....	J. S. Wright.....	2.75	4.15	0.28	1' 6"	1.15

## DAILY GAUGE-HEIGHT AND DISCHARGE of F. Cross' Ditch, near East End, for 1912.

DAY.	June.	
	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....		
2.....		
3.....	1.5	1.17
4.....	1.5	1.17
5.....	1.5	1.17
6.....	1.5	1.17
7.....	1.5	1.17
8.....	1.5	1.17
9.....	1.5	1.17
10.....	1.5	1.17
11.....	1.5	1.17
12.....	1.5	1.17
13.....	1.5	1.17
14.....	0.0	0.00
15.....	0.0	0.00
16.....	0.0	0.00
17.....	0.0	0.00
18.....	0.0	0.00
19.....	0.0	0.00
20.....	1.25	0.975
21.....	1.25	0.975
22.....	1.25	0.975
23.....	1.25	0.975
24.....	1.25	0.975
25.....	1.25	0.975
26.....	1.25	0.975
27.....	1.25	0.975
28.....	1.25	0.975
29.....	1.25	0.975
30.....	1.25	0.975
31.....		



## MONTHLY DISCHARGE of F. Cross' Ditch near, East End, for 1912.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June (3-30) .....	1.17	.975	1.08	.....	.....	47.0
The period.....						47.0

## NORTH BRANCH OF FRENCHMAN RIVER AT CROSS' RANCH.

This station was established July 25, 1908, by F. T. Fletcher. It is located on the N.-E.  $\frac{1}{4}$  Sec. 16, Tp. 7, Rge. 22, W. 3rd Mer., about two and one half miles from East End post office, and about forty-five miles south-east of Maple Creek by trail.

The gauge, which is a plain staff graduated to feet and hundredths, is placed vertically at the right bank about one mile downstream from the intake of Frank Cross' irrigation ditch, and one hundred yards below his house. The zero of the gauge (elev. 90.27) is referred to a permanent iron bench mark (assumed elev. 100.00), situated 200 feet northeast of the gauge and 1,315 feet S. 5° 36' W. from the N. E. cor. of Sec. 16, Tp. 7, Rge. 22, W. 3rd Mer.

The channel is straight for about 100 feet above and 400 feet below the station. Both banks are fairly high, but are liable to overflow during floods. The bed of the stream is sandy and may shift at high stages. The current is smooth and fairly swift.

Discharge measurements are made at or near the gauge by wading. The initial point for sounding is a square, hardwood plug driven into the ground on the right bank of the stream and marked "B.M." with white paint.

During 1912, the gauge was read by Frank Cross.

Irrigation ditches owned by F. Cross, H. Cross and W. F. McNicol take their supply from the North Branch of the Frenchman River above this station. During 1912 a small quantity of water was diverted by F. Cross and H. Cross. Records of the water diverted by F. Cross appear elsewhere in this report.

## DISCHARGE MEASUREMENTS of North Branch of Frenchman River at Cross' Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 24 ..	G. H. Whyte ..	11.5	10 52	1.55	1.41	16.26
May 18 ..	J. S. Wright ..	11.3	7 03	1.36	1.27	9.57
June 10 ..	do ..	11.2	6 67	1.03	1 19	6.86
July 8 ..	do ..	11.2	7 37	0.93	1.18	6 83
Aug. 5 ..	do ..	10.7	6 60	1.19	1.19	7.84
Sept. 6 ..	do ..	11.2	7.94	0.94	1 24	7.48
Oct. 10 ..	do ..	11.3	8 45	1.12	1.26	9.45
Oct. 29 ..	do ..	11.4	7 29	0 93	1 20	6 81
Nov. 9 ..	do ..	11.3	8.41	1 05	1.27	8 82

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DAILY GAUGE-HEIGHT AND DISCHARGE of North Branch of Frenchman River at Cross' Ranch,  
for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1.41	11.53	1.26	8.12	1.19	6.62
2.....			1.38	10.80	1.24	7.68	1.19	6.62
3.....			1.40	11.25	1.15	5.90	1.16	6.08
4.....			1.41	11.53	1.15	5.90	1.15	5.90
5.....			1.42	11.80	1.17	6.26	1.14	5.72
6.....			1.43	12.07	1.18	6.44	1.19	6.62
7.....			1.50	14.00	1.18	6.44	1.17	6.26
8.....			1.40	11.25	1.18	6.44	1.18	6.44
9.....			1.38	10.80	1.17	6.26	1.16	6.08
10.....			1.36	10.35	1.19	6.62	1.16	6.08
11.....	2.99	101.75	1.34	9.90	1.20	6.80	1.15	5.90
12.....	2.23	48.95	1.34	9.90	1.18	6.44	1.15	5.90
13.....	1.98	33.90	1.33	9.68	1.88	28.50	1.14	5.72
14.....	1.70	20.00	1.32	9.45	1.60	17.00	1.14	5.72
15.....	1.86	27.50	1.30	9.00	1.80	24.50	1.17	6.26
16.....	1.83	26.00	1.26	8.12	1.45	12.63	1.14	5.72
17.....	1.68	19.40	1.26	8.12	1.20	6.80	1.15	5.90
18.....	1.96	32.80	1.26	8.12	1.15	5.90	1.15	5.90
19.....	1.63	17.90	1.27	8.34	1.13	5.54	1.15	5.90
20.....	1.55	15.50	1.29	8.78	1.09	4.85	1.14	5.72
21.....	1.52	14.60	1.27	8.34	1.08	4.70	1.14	5.72
22.....	1.43	12.07	1.27	8.34	1.08	4.70	1.15	5.90
23.....	1.43	12.07	1.26	8.12	1.07	4.55	1.14	5.72
24.....	1.42	11.80	1.26	8.12	1.06	4.40	1.13	5.54
25.....	1.45	12.63	1.25	7.90	1.05	4.25	1.14	5.72
26.....	1.42	11.80	1.24	7.68	1.04	4.10	1.13	5.54
27.....	1.40	11.25	1.26	8.12	1.03	3.95	1.15	5.90
28.....	1.39	11.02	1.83	26.00	1.03	3.95	1.15	5.90
29.....	1.40	11.25	1.47	13.17	1.04	4.10	1.15	5.90
30.....	1.42	11.80	1.26	8.12	1.04	4.10	1.14	5.72
31.....			1.27	8.34			1.14	5.72

## DAILY GAUGE-HEIGHT AND DISCHARGE of North Branch of Frenchman River at Cross' Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.14	5.72	1.15	5.90	1.21	7.02	1.36	10.35
2.....	1.25	7.90	1.15	5.90	1.21	7.02	1.66	18.80
3.....	1.20	6.80	1.19	6.62	1.22	7.24	1.62	17.60
4.....	1.20	6.80	1.20	6.80	1.21	7.02	1.61	17.30
5.....	1.21	7.02	1.25	7.90	1.21	7.02	1.61	17.30
6.....	1.18	6.44	1.26	8.12	1.22	7.24	1.62	17.60
7.....	1.16	6.08	1.24	7.68	1.23	7.46	1.68	19.40
8.....	1.15	5.90	1.22	7.24	1.23	7.46	1.75	22.25
9.....	1.12	5.36	1.20	6.80	1.38	10.80	1.28	8.56
10.....	1.12	5.36	1.18	6.44	1.30	9.00	1.27	8.34
11.....	1.12	5.36	1.17	6.26	1.26	8.12	1.30	9.00
12.....	1.12	5.36	1.17	6.26	1.25	7.90	1.62	17.60
13.....	1.12	5.36	1.19	6.62	1.25	7.90	1.65	18.50
14.....	1.12	5.36	1.33	9.68	1.24	7.68	1.65	18.50
15.....	1.12	5.36	1.28	8.56	1.23	7.46	1.63	17.90
16.....	1.23	7.46	1.24	7.68	1.23	7.46	.....	.....
17.....	1.23	7.46	1.22	7.24	1.22	7.24	.....	.....
18.....	1.16	6.08	1.21	7.02	1.21	7.02	.....	.....
19.....	1.25	7.90	1.23	7.46	1.21	7.02	.....	.....
20.....	1.23	7.46	1.22	7.24	1.33	9.68	.....	.....
21.....	1.17	6.26	1.25	7.90	1.32	9.45	.....	.....
22.....	1.15	5.90	1.27	8.34	1.31	9.22	.....	.....
23.....	1.15	5.90	1.27	8.34	1.29	8.78	.....	.....
24.....	1.13	5.54	1.26	8.12	1.26	8.12	.....	.....
25.....	1.14	5.72	1.26	8.12	1.26	8.12	.....	.....
26.....	1.15	5.90	1.25	7.90	1.26	8.12	.....	.....
27.....	1.20	6.80	1.24	7.68	1.25	7.90	.....	.....
28.....	1.20	6.80	1.25	7.90	1.25	7.90	.....	.....
29.....	1.19	6.62	1.24	7.68	1.24	7.68	.....	.....
30.....	1.17	6.26	1.22	7.24	1.45	12.63	.....	.....
31.....	1.15	5.90	.....	.....	1.52	14.60	.....	.....

## MONTHLY DISCHARGE of North Branch of Frenchman River at Cross' Ranch, for 1912.

(Drainage area 53 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in Inches on Drainage Area.	Total in Acre-feet.
April.....	101.75	11.02	23.20	0.44	0.33	928.00
May.....	26.00	7.68	10.23	0.19	0.22	629.00
June.....	28.50	3.95	7.58	0.14	0.18	451.00
July.....	6.62	5.54	5.94	0.11	0.13	365.00
August.....	7.90	5.36	6.26	0.12	0.14	385.00
September.....	9.68	5.90	7.42	0.14	0.16	442.00
October.....	14.60	7.02	8.30	0.16	0.18	510.00
November.....	22.25	8.34	15.90	0.30	0.17	473.00
The period.....	.....	.....	.....	.....	1.49	4,183.00

## FRENCHMAN RIVER AT PHILLIPS' RANCH.

This station was established in November, 1911, by G. H. Whyte. It is located on Phillips' ranch, in the N. E.  $\frac{1}{4}$  Sec. 23, Tp. 6, Rge. 23, W. 3rd Mer. It is 13 miles by trail from East End post office.

## SESSIONAL PAPER No. 25d

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the left bank about 900 feet upstream from the station. The zero (elev. 90.02) is referred to a permanent iron bench mark (assumed elev. 100.00), located on the left bank and about 25 feet N. E. of the gauge.

The river flows in one channel at all stages. It is straight for 300 feet above and 500 feet below the station. Both banks are slightly wooded, high and not liable to overflow. The bed of the stream is composed of sand and gravel.

Discharge measurements are made during high water by means of a cable car, tagged wire and stay wire, and at low stages by wading. The initial point for soundings is the anchorage on the left bank, and marked I.P. 0+00.

During 1912, the gauge was read by A. A. Phillips.

## DISCHARGE MEASUREMENTS of Frenchman River at Phillips' Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 11.....	J. S. Wright.....	36.	34.9	1.26	1.64①	43.89
July 9.....	do.....	36.	32.61	0.82	1.48①	26.79
Aug. 6.....	do.....	35.	30.05	0.63	1.33	19.15
Sept. 7.....	do.....	35 25	28.94	0.62	1.33	17.90
Oct. 11.....	do.....	35.	31.44	0.69	1.40	21.7
Nov. 11.....	do.....	37.9	44.7	1.21	1.76	54.16

① Gauge heights interpolated.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Frenchman River at Phillips' Ranch, for 1912.

DAY.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.21	13.84	1.30	17.00	1.34	18.76	1.47	26.14
2.....			1.22	14.18	1.28	16.28	1.34	18.76	1.48	26.86
3.....			1.22	14.18	1.28	16.28	1.35	19.20	1.50	28.30
4.....			1.26	15.56	1.28	16.28	1.35	19.20	1.51	29.04
5.....			1.32	17.88	1.36	19.70	1.35	19.20	1.51	29.04
6.....			1.33	18.32	1.34	18.76	1.34	18.76	1.53	30.52
7.....			1.32	17.88	1.33	18.32	1.34	18.76	1.54	31.26
8.....			1.30	17.00	1.35	19.20	1.34	18.76	1.60	36.50
9.....	1.48	26.86	1.26	15.56	1.34	18.76	1.34	18.76	1.64	40.74
10.....	1.44	24.10	1.22	14.18	1.31	17.44	1.35	19.20	1.65	41.80
11.....	1.44	24.10	1.22	14.18	1.32	17.88	1.40	21.70	1.65	41.80
12.....	1.44	24.10	1.21	13.84	1.32	17.88	1.40	21.70	1.66	42.92
13.....	1.46	25.42	1.22	14.18	1.32	17.88	1.40	21.70	1.66	42.92
14.....	1.45	24.70	1.22	14.18	1.31	17.44	1.40	21.70	1.65	41.80
15.....	1.43	23.50	1.24	14.86	1.31	17.44	1.41	22.30	1.65	41.80
16.....	1.41	22.30	1.34	18.76	1.31	17.44	1.41	22.30		
17.....	1.41	22.30	1.36	19.70	1.31	17.44	1.43	23.50		
18.....	1.40	21.70	1.32	17.88	1.31	17.44	1.43	23.50		
19.....	1.38	20.70	1.40	21.70	1.30	17.00	1.43	23.50		
20.....	1.38	20.70	1.41	22.30	1.31	17.44	1.43	23.50		
21.....	1.38	20.70	1.38	20.70	1.34	18.76	1.43	23.50		
22.....	1.37	20.20	1.34	18.76	1.34	18.76	1.43	23.50		
23.....	1.35	19.20	1.31	17.44	1.34	18.76	1.43	23.50		
24.....	1.32	17.88	1.30	17.00	1.33	18.32	1.44	24.10		
25.....	1.31	17.44	1.28	16.28	1.33	18.32	1.44	24.10		
26.....	1.32	17.88	1.26	15.56	1.33	18.32	1.44	24.10		
27.....	1.29	16.64	1.30	17.00	1.33	18.32	1.44	24.10		
28.....	1.28	16.28	1.34	18.76	1.34	18.76	1.44	24.10		
29.....	1.27	15.92	1.32	17.88	1.34	18.76	1.45	24.70		
30.....	1.25	15.29	1.32	17.88	1.34	18.76	1.45	24.70		
31.....	1.23	14.52	1.32	17.88			1.46	25.42		

## MONTHLY DISCHARGE of Frenchman River, at Phillips' Ranch, for 1912.

(Drainage area 625 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
July (9-31).....	26.86	14.52	22.60	0.036	0.031	1031.
August.....	22.30	13.84	16.95	0.027	0.031	1042.
September.....	19.70	15.28	17.97	0.029	0.032	1068.
October.....	25.42	18.76	21.95	0.035	0.040	1360.
November (1-15).....	42.92	26.14	35.43	0.057	0.032	1054.
The period.....					0.166	5545.

## STRONG AND DAY'S DITCH NEAR EAST END.

This station was established April 17, 1911, by G. H. Whyte, to replace the station on Sec. 36, Tp. 6, Rge. 22, W. 3rd Mer. It is located on the N. E.  $\frac{1}{4}$  Sec. 25, Tp. 6, Rge. 22, W. 3rd Mer., and is three-quarters of a mile above the old station and about half a mile below the head-gate of the ditch.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the right bank of the ditch. It is referred to bench marks as follows:—(1) A spike on the initial post, which is about six inches above ground, on the left bank of the ditch; elevation 5.49 feet above the datum of the gauge. (2) The top of a plug, about four inches above ground, on the top of the right bank and about 50 feet downstream from the gauge; elevation 7.52 feet above the datum of the gauge.

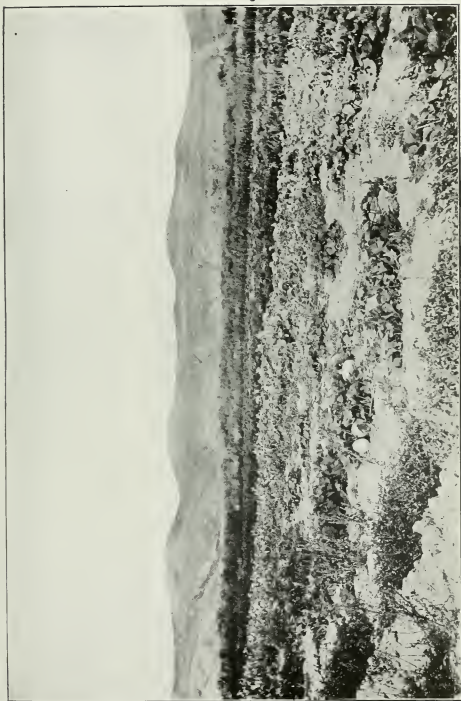
The ditch is straight for about 250 feet above and 100 feet below the station. The current is rather sluggish and, during a greater part of the season vegetation in the ditch causes considerable trouble in making discharge measurements.

Discharge measurements are made at the rod by wading, or from the old bridge station (for description see 1910 report). The initial point for soundings at the station is a plug on the left bank, 23 feet from the rod.

During 1912, the gauge was read by E. Robertson, blacksmith for Strong & Day.

## DISCHARGE MEASUREMENTS of Strong and Day's Ditch near East End, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Fl. per sec.	Feet.	Sec.-ft.
July 2.....	J. S. Wright.....	17.0	15.0	1.20	1.43	17.94
July 27.....	do .....	14.7	12.19	0.98	1.16	11.95
Aug. 26.....	do .....	11.8	6.42	0.74	0.78	4.78



Strong and Day's irrigated garden. Taken by M. H. French.



## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Strong and Day's Ditch near East End, for 1912.

DAY.	June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1.36	16.06	1.50	20.00	0.74	4.29
2			1.43	17.94	1.51	20.30	.74	4.29
3			1.61	23.30	1.50	20.00	.72	4.07
4			1.66	24.80	1.50	20.00	.70	3.85
5			1.66	24.80	1.48	19.40	.68	3.65
6			1.65	24.50	1.47	19.10	.67	3.55①
7			1.65	24.50	1.46	18.80		
8			1.64	24.20	1.44	18.22		
9			1.64	24.20	1.42	17.66		
10			1.65	24.50	1.40	17.16		
11			1.64	24.20	1.38	16.58		
12			1.62	23.60	1.37	16.32		
13			1.63	23.90	1.36	16.06		
14			1.64	24.20	1.36	16.06		
15			1.64	24.20	1.34	15.54		
16			1.64	24.20	1.32	15.02		
17			1.63	23.90	1.30	14.50		
18			1.63	23.90	1.28	13.98		
19			1.62	23.60	1.20	12.00		
20	0.05	.00②	1.62	23.60	1.10	9.90		
21	.06	.00	1.63	23.90	1.08	9.50		
22	.96	7.32	1.64	24.20	1.00	8.00		
23	1.02	8.36	1.62	23.60	0.80	5.00		
24	1.04	8.72	1.61	23.30	.80	5.00		
25	1.05	8.90	1.62	23.60	.80	5.00		
26	1.06	9.00	1.63	23.90	.78	4.76		
27	1.16	11.12	1.62	23.60	.80	5.00		
28	1.26	13.46	1.62	23.60	.80	5.00		
29	1.26	13.46	1.61	23.30	.80	5.00		
30	1.26	13.46	1.60	23.00	.80	5.00		
31			1.59	22.70	.76	4.52		

① Headgates opened for the season.

② Headgates closed for the season.

## MONTHLY DISCHARGE of Strong and Day's Ditch near East End, for 1912.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June (20-30).....	13.46	0.00	8.53			186.
July.....	24.80	16.06	23.44			1,441.
August.....	20.30	4.52	12.85			790.
September (1-6).....	4.29	3.55	3.95			47.
The period.....						2,464.

## FRENCHMAN RIVER AT STRONG AND DAY'S RANCH.

This station was established July 31, 1908, by F. T. Fletcher. It is located at Strong and Day's highway bridge on the N.E.  $\frac{1}{4}$  Sec. 31, Tp. 6, Rge. 21, W. 3rd Mer., and is about eight miles south of East End post office and a mile above the East End Police Detachment.

The gauge, which is of the standard chain type, is fixed to the floor of the east end of the upstream side of the bridge. The length of chain from the marker to the bottom of the weight is 16.80 feet. The zero of the gauge (elev. 85.54) is referred to a permanent iron bench mark (assumed elev. 100.00), situated 240 feet N.  $11^{\circ}$  E. from the gauge. This gauge reads one foot higher than the staff gauge used during previous years.



The channel is straight for 300 feet above and 600 feet below the station. Both banks are high and not liable to overflow. The bed of the stream is composed of sand and gravel. The current is sluggish.

Discharge measurements are made from the lower side of the bridge during high water stages, and at a wading section a short distance upstream during low water stages. The initial point for soundings is the inner face of the left abutment. The bridge is not quite at right angles to the direction of the current.

During 1912, the gauge was read twice each day by E. Robertson, blacksmith for Strong and Day.

Three miles above the station are the dam and headgates of Messrs. Strong and Day's ditch and hence the discharge of the stream at the station does not include that of the ditch, and the latter must be added in order to obtain the total flow of the Frenchman River.

During the spring floods of 1912, which took place on April 9 to April 12, the flow was estimated by using Strong and Day's dam as a broad crested weir to be about 7,000 sec.-ft., and a slope measurement gave about the same result.

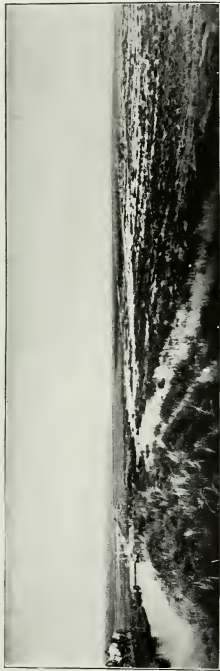
#### DISCHARGE MEASUREMENTS of Frenchman River at Strong and Day's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 24.....	G. H. Whyte.....	38.0	133.9	2.42	4.705	324.46
April 25.....	do.....	38.0	133.8	2.40	4.63	321.10
May 13.....	J. S. Wright.....	36.0	100.45	1.68	3.78	169.11
June 8.....	do.....	26.3	28.15	2.15	2.77	60.56
July 2.....	do.....	21.0	16.77	0.72	1.94	12.08
July 29.....	do.....	19.2	13.26	0.52	1.74	6.93
Aug. 24.....	do.....	20.1	15.36	0.54	1.89	8.29
Oct. 7.....	do.....	24.6	20.2	0.94	1.98	19.15
Nov. 2.....	do.....	24.9	20.4	0.65	2.18	13.25

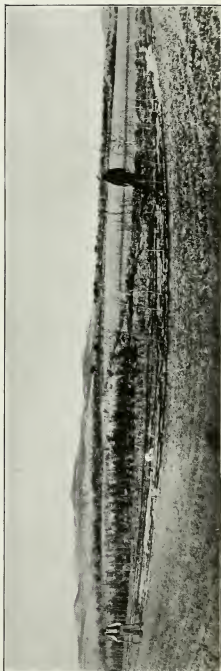
#### DAILY GAUGE-HEIGHT AND DISCHARGE of Frenchman River at Strong and Day's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.32	①.....	4.26	263.8	3.63	149.9	1.95	12.75
2.....	5.51	.....	4.33	258.4	3.29	110.0	1.94	12.45
3.....	5.99	.....	4.17	229.9	3.21	102.0	1.93	12.15
4.....	7.12	.....	4.11	219.7	3.12	93.0	1.93	12.15
5.....	8.10	.....	4.09	216.3	3.02	83.0	1.95	12.75
6.....	7.80	.....	4.06	211.2	2.82	65.6	1.94	12.45
7.....	10.75	.....	4.10	218.0	2.72	57.6	1.92	11.85
8.....	11.72	.....	4.18	231.6	2.77	61.6	1.92	11.85
9.....	12.89	.....	4.30	253.0	2.58	46.6	1.88	10.65
10.....	14.00	.....	4.34	260.2	2.50	41.0	1.88	10.65
11.....	14.00	.....	4.07	212.9	2.59	41.0	1.86	10.05
12.....	14.00	.....	3.95	193.5	2.41	35.1	1.87	10.35
13.....	8.08	1460.0	3.78	169.4	2.38	33.3	1.86	10.05
14.....	7.05	801.0	3.66	153.8	2.46	38.2	1.87	10.35
15.....	6.62	773.4	3.61	147.3	3.12	93.0	1.86	10.05
16.....	6.32	695.2	3.60	146.0	3.17	98.0	1.87	10.35
17.....	6.28	685.0	3.53	137.6	3.04	85.0	1.87	10.35
18.....	6.04	625.0	3.47	130.4	2.96	77.4	1.86	10.05
19.....	5.62	546.6	3.37	118.7	3.02	83.0	1.84	9.50
20.....	5.27	449.4	3.31	112.1	2.65	52.0	1.83	9.25
21.....	5.16	425.6	3.32	113.2	2.59	44.5	1.82	9.00
22.....	5.15	423.5	3.31	112.1	2.54	43.8	1.82	9.00
23.....	4.96	383.6	3.30	111.0	2.52	42.4	1.82	9.00
24.....	4.76	342.0	3.33	114.3	2.05	16.75	1.82	9.00
25.....	4.63	316.0	3.00	81.00	1.98	13.95	1.82	9.00
26.....	4.62	314.0	3.02	83.0	1.99	14.35	1.82	9.00
27.....	4.54	298.0	3.11	92.0	1.97	13.55	1.82	9.00
28.....	4.48	286.2	3.48	131.6	1.96	13.15	1.82	9.00
29.....	4.40	271.0	4.12	221.4	1.95	12.75	1.82	9.00
30.....	4.36	263.8	4.07	212.9	1.93	12.75	1.81	8.75
31.....	.....	.....	4.09	216.3	.....	.....	1.78	8.00

①Ice conditions April 1 to 12. Not sufficient data to compute the daily discharges.



Flood Irrigation on J. A. Gaff's Ranch near Battle Creek, Saskatchewan. Taken by F. H. Peters.



Irrigating young trees on Strong and Day's Ranch near East End, Saskatchewan. Taken by F. H. Peters.



**DAILY GAUGE-HEIGHT AND DISCHARGE of Frenchman River at Enright & Strong's, for 1911.**

DAY.	April		May		June		July	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	4 60	485	2 50	102	2 00	57	1 85	45
2.....	4 40	439	2 40	112	2 05	42	1 95	53
3.....	4 40	439	2 45	98	2 10	66	1 95	53
4.....	3 90	336	2 35	88	1 90	49	2 05	62
5.....	3 70	300	2 45	98	2 00	57	2 05	62
6.....	3 20	223	2 40	93	1 90	49	1 95	53
7.....	3 30	238	2 30	84	1 90	49	2 00	57
8.....	2 70	157	2 05	62	1 85	43	1 85	45
9.....	2 70	157	1 70	34	1 80	41	1 72	35
10.....	6 50	904	1 80	41	2 00	57	1 62	28
11.....	8 40	1,870	2 30	84	2 00	57	1 61	28
12.....	6 50	1,126	2 30	84	1 90	49	1 62	28
13.....	4 70	516	2 40	93	1 75	38	1 62	28
14.....	4 00	344	2 30	84	1 55	24	1 63	29
15.....	3 80	295	2 30	84	1 65	30	1 62	28
16.....	2 80	144	2 40	93	1 60	27	1 59	26
17.....	5 74	738	2 40	93	1 90	49	1 54	23
18.....	5 75	742	2 30	84	1 75	38	1 53	22
19.....	4 45	388	2 25	80	1 65	30	1 52	21
20.....	4 10	319	2 30	84	1 75	38	1 53	22
21.....	4 05	310	2 20	75	2 55	107	1 52	21
22.....	3 90	284	2 15	70	1 80	41	1 52	21
23.....	3 70	251	2 10	66	1 75	38	1 53	22
24.....	3 30	194	2 20	75	1 60	53	1 53	22
25.....	3 10	168	2 20	75	1 80	41	1 50	20
26.....	3 00	156	2 10	66	1 70	34	1 48	19
27.....	2 90	144	2 10	66	1 75	38	1 49	19
28.....	2 75	128	2 10	66	1 75	38	1 42	14
29.....	2 65	117	2 00	57	1 75	38	1 49	19
30.....	2 45	98	2 10	66	1 90	49	1 50	20
31.....			2 10	66			1 50	20

NOTE.—The above table is inserted in this report to correct a table which was published on page 205 of the report for 1911. A decimal point was inadvertently inserted in the table of daily discharge for April, 1911.



## SESSIONAL PAPER No. 25d

DAILY GAUGE-HEIGHT AND DISCHARGE of Frenchman River at Strong and Day's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.78	8.00	2.12	19.55	2.04	16.35	2.13	19.95
2.....	1.75	7.25	2.11	19.15	2.04	16.35	2.18	22.10
3.....	1.76	7.50	2.12	19.55	2.02	15.55	2.10	18.75
4.....	1.75	7.25	2.12	19.55	2.00	14.75	2.11	19.15
5.....	1.75	7.25	2.12	19.55	1.97	13.55	2.12	19.55
6.....	1.75	7.25	2.11	19.15	1.97	13.55	2.14	20.35
7.....	1.78	8.00	2.15	20.75	1.94	12.45	2.17	21.65
8.....	1.78	8.00	2.14	20.35	1.98	13.95	2.20	23.00
9.....	1.78	8.00	2.14	20.35	2.00	14.75	2.18	22.10
10.....	1.76	7.50	2.14	20.35	1.98	13.95	2.25	25.50
11.....	1.78	8.00	2.16	21.20	1.97	13.55	2.40	34.50
12.....	1.79	8.25	2.14	20.35	1.96	13.15	2.47	38.90
13.....	1.77	7.75	2.14	20.35	1.96	13.15	2.48	39.60
14.....	1.76	7.50	2.11	19.15	1.98	13.95	2.52	42.40
15.....	1.74	7.00	2.10	18.75	2.00	14.75	2.53	43.10
16.....	1.76	7.50	2.08	17.95	2.00	14.75	.....	.....
17.....	1.76	7.50	2.08	17.95	2.06	17.15	.....	.....
18.....	1.76	7.50	2.08	17.95	2.06	17.15	.....	.....
19.....	1.78	8.00	2.10	18.75	2.08	17.95	.....	.....
20.....	1.78	8.00	3.84	①177.6	2.09	18.35	.....	.....
21.....	1.78	8.00	2.90	72.25	2.14	20.35	.....	.....
22.....	1.78	8.00	2.14	20.35	2.13	19.95	.....	.....
23.....	1.84	9.50	2.13	19.95	2.14	20.35	.....	.....
24.....	1.89	10.95	2.10	18.75	2.14	20.35	.....	.....
25.....	1.92	11.85	2.09	18.35	2.16	21.20	.....	.....
26.....	1.90	11.25	2.08	17.95	2.16	21.20	.....	.....
27.....	1.92	11.85	2.07	17.55	2.16	21.20	.....	.....
28.....	1.99	14.35	2.06	17.15	2.16	21.20	.....	.....
29.....	2.08	17.95	2.06	17.15	2.16	21.20	.....	.....
30.....	2.11	19.15	2.04	16.35	2.16	21.20	.....	.....
31.....	2.12	19.55	.....	.....	2.15	20.75	.....	.....

① Flash boards taken out of Strong &amp; Day's dam.

MONTHLY DISCHARGE OF ①Frenchman River at Strong and Day's Ranch, for 1912.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in Inches on Drainage Area.	Total in Acre-feet.
April (13-30).....	1460.	263.8	523.5	0.766	0.51	18,690.
May.....	263.8	81.	173.2	0.254	0.29	10,649.
June.....	149.9	22.85	58.9	0.086	0.096	3,505.
July.....	37.55	28.81	53.7	0.049	0.057	2,072.
August.....	28.	14.5	22.4	0.033	0.038	1,377.
September.....	177.6	16.35	26.9	0.038	0.042	1,601.
October.....	21.2	12.45	17.1	0.025	0.03	1,051.
November (1-15).....	43.1	18.75	27.4	0.040	0.02	815.
The period.....	.....	.....	.....	.....	1.08	39,760.

① The discharges of Strong &amp; Day's Ditch have been added to those of the Frenchman River in this table.

## MORRISON BROTHERS' DITCH.

This station was established August 22, 1911, by G. R. Elliott on Morrison Brothers' Irrigation Ditch, which diverts water from the Frenchman River on S.E.  $\frac{1}{4}$  Sec. 27, Tp. 6, Rge. 21, W. 3rd Mer.

The gauge is located on the S.W.  $\frac{1}{4}$  Sec. 26, and is about one half mile from the intake of the ditch. It is a plain staff, 3" x 1" graduated to feet and inches and is on the right side of the ditch. The zero of the gauge (elev. 97.36) is referred to the top of a rock 300 feet downstream on the right bank (assumed elev. 100.00) and marked "B.M." with red paint.

The station is at a uniform cross-section of the ditch which is seven feet wide at the bottom with side slopes of 4 to 1.

During 1912 no water was diverted, as the dam in the Frenchman River was washed out by the spring floods of 1912.

#### MULE CREEK AT ERWIN'S RANCH.

This station was established May 12, 1911, by G. H. Whyte. It is located on the S.E.  $\frac{1}{4}$  Sec. 34, Tp. 5, Rge. 17, W. 3rd Mer. It is about 48 miles by trail from East End and about one quarter of a mile from the junction of the stream with Frenchman River.

It was impossible to get a satisfactory gauge height observer for this station during 1912, The gauge was destroyed by cattle during the fall.

#### DISCHARGE MEASUREMENTS of Mule Creek at Erwin's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
July 5.....	J. S. Wright.....	8.0	1.99	0.93	0.64	1.85
Aug. 29.....	do.....	6.2	2.07	0.79	1.23	1.63
Nov. 6.....	do.....	5.4	2.09	0.38	.....①	0.79

① Gauge destroyed.

#### MISCELLANEOUS DISCHARGE MEASUREMENTS made in Frenchman River drainage basin, in 1912.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. feet.</i>	<i>Feet per sec.</i>	<i>Sec.-ft.</i>
June 11....	J. S. Wright....	Barnett's Ditch....	17-7-22-3....	1.7	0.87	0.47	0.41
July 9.....	do.....	do.....	do.....	3.3	1.35	0.29	0.39
May 18.....	do.....	Calf Creek.....	5-8-22-3.....	5.1	1.58	0.94	1.51
June 10.....	do.....	do.....	do.....	3.5	1.21	1.50	1.81
July 8.....	do.....	do.....	do.....	①	.....	.....	0.064
Aug. 5.....	do.....	do.....	do.....	4.0	1.59	0.65	1.03
Sept. 5.....	do.....	do.....	do.....	4.2	1.60	0.85	1.36
Sept. 24.....	do.....	do.....	do.....	4.0	1.55	1.02	1.59
Oct. 29.....	do.....	do.....	do.....	4.1	1.51	1.26	1.91
July 9.....	do.....	Concrete Coulee....	11-7-23-3....	5.4	1.46	0.84	0.49
Aug. 6.....	do.....	do.....	do.....	5.5	1.77	0.75	1.33
Sept. 6.....	do.....	do.....	do.....	6.0	2.03	0.81	1.64
Oct. 11.....	do.....	do.....	do.....	6.4	1.96	0.96	1.88
July 8.....	do.....	H. Cross' Ditch.....	5-8-22-3.....	3.9	1.68	1.04	1.75
Aug. 5.....	do.....	do.....	do.....	3.8	1.36	0.59	0.80
Sept. 5.....	do.....	do.....	do.....	3.7	1.24	0.37	0.46
Sept. 24.....	do.....	do.....	do.....	3.7	1.20	0.68	0.81
Oct. 29.....	do.....	do.....	do.....	①	.....	.....	NIL
June 11.....	do.....	Doyle Coulee.....	17-7-22-3....	1.70	0.60	0.78	0.47
July 9.....	do.....	do.....	do.....	①	.....	.....	0.065
Aug. 6.....	do.....	do.....	do.....	①	.....	.....	0.167
Sept. 6.....	do.....	do.....	do.....	①	.....	.....	0.4245
Oct. 11.....	do.....	do.....	do.....	①	.....	.....	0.645
July 5.....	do.....	Frenchman.....	N.E. 21-5-17-3..	33.5	23.79	1.37	32.33
Aug. 30.....	do.....	do.....	do.....	31.3	19.22	0.79	15.17
Nov. 6.....	do.....	do.....	do.....	32.6	21.8	1.14	24.5
Aug. 8.....	do.....	do.....	N.E. 22-6-25-3..	16.3	10.99	0.47	5.17
July 9.....	do.....	Pearse's Ditch.....	11-7-23-3.....	3.3	0.81	0.44	0.36
Aug. 29.....	do.....	Spring Creek.....	S.W. 7-6-16-3..	2.2	0.93	0.75	0.70

① Weir measurement.

## SWIFTCURRENT CREEK DRAINAGE BASIN.

*General Description.*

Swiftcurrent Creek rises on the eastern slope of the Cypress Hills and follows a north-easterly course for 75 miles and then a northerly one for about 25 miles and finally empties into the South Saskatchewan River in Tp. 20, Rge. 13, W. 3rd Mer.

The only important tributary is Bone Creek, which rises in the Cypress Hills and joins the Swiftcurrent in Tp. 10, Rge. 19, W. 3rd Mer.

The main stream flows through a valley, two to three hundred feet deep and a mile wide, to within a few miles of its mouth, where it enters a sandstone gorge, about five hundred feet deep.

The bench land above the creek is of rolling prairie, broken by innumerable coulees. The soil is a sandy loam. There is very little tree growth along the stream.

The mean annual rainfall at the town of Swift Current is about fifteen inches. This increases slightly at the stream's headwaters. The greatest precipitation occurs during the months of May, June, and July. From November to April the stream is frozen over.

There are a number of small irrigation ditches in this drainage basin, and the town of Swift Current and the Canadian Pacific Railway Company take water for domestic and industrial purposes from the Creek.

## POLLOCK DITCH NEAR SOUTH FORK.

This station was established August 10, 1911, by G. R. Elliott on the irrigation ditch of M.D. Pollock, which diverts water from Swiftcurrent Creek on the N.E.  $\frac{1}{4}$  Sec. 22, Tp. 7, Rge. 21, W. 3rd Mer.

The gauge is located on the N.E.  $\frac{1}{4}$  Sec. 22, about 20 feet from the intake. The gauge, which is a plain staff graduated to feet and inches, is situated at the left side of the ditch. The zero (elev. 91.96) is referred to a permanent iron bench mark (assumed elev. 100.00), located at the gauging station on Swiftcurrent Creek, which is three-quarters of a mile below.

The station is at a uniform section of the ditch, which is one and a half feet wide at the bottom, with side slopes of one to one and two to one.

During 1912, the gauge was read by D. Pollock.

## DISCHARGE MEASUREMENTS of Pollock Ditch near South Fork, for 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 5.....	J. S. Wright.....					Nil ①
June 27.....	do .....	2 3 .....	0.37 .....	0.92 .....	0.54 .....	0.34 .....
July 30.....	do .....					Nil ①

① Ditch not in use.



## DAILY GAUGE-HEIGHT AND DISCHARGE of Pollock's Ditch, near South Fork, for 1912.

DAY.	June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			0.50	0.31
2.....			0.50	0.31
3.....			0.42	0.25
4.....			0.67	0.43
5.....			0.83	0.56
6.....				
7.....			0.75	0.50
8.....			0.67	0.43
9.....			0.50	0.31
10.....	0.58	①0.37	0.50	0.31
11.....	0.50	0.31	0.50	③0.31
12.....	0.50	0.31		
13.....	0.58	0.37		
14.....	1.25	0.87		
15.....	1.46	1.02		
16.....	0.83	0.56		
17.....	0.62	0.40	0.50	①0.31
18.....	0.50	0.31	0.50	0.31
19.....	0.54	0.34	0.42	0.25
20.....	0.54	0.34	0.42	0.25
21.....	0.50	0.31	0.42	0.25
22.....	0.50	0.31	0.42	③0.25
23.....	0.50	0.31		
24.....	0.50	0.31		
25.....	0.50	0.31		
26.....	0.50	0.31		
27.....	0.54	0.34		
28.....	0.50	0.31		
29.....	0.50	0.31		
30.....	0.50	0.31		
31.....				

① Headgates opened.

③ Headgates closed.

## MONTHLY DISCHARGE of Pollock's Ditch, near South Fork, in 1912.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June (10-30).....	1.02	0.31	0.397			17.
July (1-22).....	0.56	0.25	0.332			11.
The period.....						28.

## SWIFTCURRENT CREEK AT POLLOCK'S RANCH.

This station was established May 18, 1909, by H. R. Carscallen. It is located on the N.E.  $\frac{1}{4}$  Sec. 22, Tp. 7, Rge. 21, W. 3rd Mer., about four miles southwest of Southfork P.O.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post sunk in the bed of the stream at the right bank and firmly stayed. The zero of the gauge (elev. 89.25) is referred to a permanent iron bench mark (assumed elev. 100.00), situated 138 feet N. 30° E. of the gauge.

The channel is straight for fifty feet above and fifteen feet below the station. Both banks are high and not liable to overflow. The bed of the stream is composed of sand and gravel. The current is moderate at ordinary stages, but sluggish at very low stages of the stream.

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Discharge measurements are made at or near the gauge, by wading at ordinary stages, and at very low stages a weir is used.

During 1912, the gauge was read by D. Pollock.

Mr. D. Pollock diverts water from the creek into an irrigation ditch about one-half mile above the gauge, and when he is using water in this ditch the gauge does not record the total flow of the creek.

## DISCHARGE MEASUREMENTS of Swiftcurrent Creek at Pollock's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 26.....	G. H. Whyte.....	6.0	3.86	1.78	1.33	6.89
May 14.....	J. S. Wright.....	3.9	3.00	1.30	0.98	3.91
June 5.....	do.....	4.5	1.51	1.07	0.81	1.61
June 27.....	do.....	3.9	1.12	0.61	0.65	0.68
July 30.....	do.....	4.2	1.35	0.68	0.68	0.92
Sept. 2.....	do.....	4.7	1.88	0.70	0.80	1.32
Oct. 1.....	do.....	4.7	1.85	0.69	0.83	1.27
Oct. 30.....	do.....	4.6	1.83	0.75	0.88	1.37①

① Ice conditions.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Swiftcurrent Creek at Pollock's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.14	5.0	.97	2.8	.65	.67
2.....			1.09	4.3	.97	2.8	.65	.67
3.....			1.07	4.1	.97	2.8	.64	.64
4.....			1.07	4.1	.91	2.2	.67	.74
5.....			1.14	5.0	.85	1.69	.69	.80
6.....			1.09	4.3	.84	1.62	.68	.77
7.....	3.81	49	1.07	4.1	.84	1.62	.67	.74
8.....	3.49	43	1.04	3.7	.84	1.62	.65	.67
9.....	2.42	26	.99	3.1	.84	1.62	.65	.67
10.....	2.41	26	.99	3.1	.73	.97①	.65	.67
11.....	2.41	26	.99	3.1	.73	.97	.65	.67②
12.....	2.41	26	.99	3.1	.72	.93	.80	1.34
13.....	2.43	26	.99	3.1	.71	.88	.80	1.34
14.....	2.39	25	.99	3.1	.89	2.0①	.80	1.34
15.....	2.29	24	.99	3.1	1.39	8.9	.80	1.34
16.....	2.29	24	.99	3.1	.94	2.5	.63	.61
17.....	2.18	22	.99	3.1	.89	2	.63	.61
18.....	2.11	21	.99	3.1	.84	1.62	.63	.61
19.....	1.94	17.9	.99	3.1	.73	.97	.62	.58
20.....	1.74	14.6	.99	3.1	.71	.88	.62	.58
21.....	1.67	13.4	.99	3.1	.69	.80	.62	.58
22.....	1.58	12.0	1.01	3.3	.68	.77	.62	.58
23.....	1.49	10.5	1.01	3.3	.68	.77	.62	.58
24.....	1.48	10.3	.99	3.1	.67	.74	.63	.61
25.....	1.42	9.4	.99	3.1	.66	.70	.65	.67
26.....	1.29	7.3	.99	3.1	.66	.70	.66	.70
27.....	1.19	5.8	1.01	3.3	.65	.67	.67	.74
28.....	1.19	5.8	1.39	8.9	.65	.67	.68	.77
29.....	1.19	5.8	1.24	6.5	.65	.67	.68	.77
30.....	1.19	5.8	1.14	5.0	.65	.67	.68	.77
31.....			1.04	3.7			.71	.88

① Pollock's Ditch opened. ② Ditch closed.

③ Rain caused increased discharge.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Swiftcurrent Creek at Pollock's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	.71	.88	.84	1.62	.83	1.27	.88	1.95
2.....	.79	1.29	.80	1.32 <sup>①</sup>	.83	1.24	.90	2.1
3.....	.77	1.17	.82	1.42	.83	1.24	.92	2.3
4.....	.73	.97	.91	2.1	.85	1.37	.92	2.3
5.....	.71	.88	.87	1.80	.85	1.37	.92	2.3
6.....	.71	.88	.82	1.42	.85	1.35	.90	2.1
7.....	.71	.88	.82	1.39	.83	1.22	.87	1.86
8.....	.71	.88	.82	1.39	.87	1.48	.86	1.78
9.....	.71	.88	.81	1.32	.90	1.70	.84	1.62
10.....	.71	.88	.81	1.32	.91	1.74	.86	1.78
11.....	.71	.88	.81	1.30	.92	1.82	.86	1.78
12.....	.70	.84	.80	1.24	.91	1.74	.86	1.78
13.....	.70	.84	.80	1.24	.89	1.59	.84	1.62
14.....	.69	.80	.80	1.24	.86	1.36	.84	1.62
15.....	.69	.80	.80	1.21	.86	1.36	.84	1.62
16.....	.84	1.62	.80	1.21	.86	1.36	.....	.....
17.....	.77	1.17	.80	1.21	.87	1.43	.....	.....
18.....	.77	1.17	.80	1.21	.91	1.68	.....	.....
19.....	.75	1.06	.82	1.30	.91	1.68	.....	.....
20.....	.74	1.02	.82	1.30	.92	1.76	.....	.....
21.....	.74	1.02	.82	1.30	.92	1.76	.....	.....
22.....	.74	1.02	.82	1.30	.92	1.72	.....	.....
23.....	.74	1.02	.82	1.28	.92	1.72	.....	.....
24.....	.74	1.02	.81	1.22	.92	1.72	.....	.....
25.....	.74	1.02	.81	1.22	.92	1.72	.....	.....
26.....	.74	1.02	.82	1.28	.92	1.68	.....	.....
27.....	.84	1.62	.82	1.24	.91	1.60	.....	.....
28.....	.82	1.48	.82	1.24	.90	1.54	.....	.....
29.....	.94	2.5	.83	1.30	.89	1.46	.....	.....
30.....	.94	2.5	.83	1.30	.88	1.37 <sup>①</sup>	.....	.....
31.....	.89	2.0	.....	.....	.86	1.7	.....	.....

① Shifting conditions Sept. 2nd, to October, 30th.

## MONTHLY DISCHARGE of Swiftcurrent Creek at Pollock's Ranch, for 1912.

(Drainage area 16 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in Inches on Drainage Area.	Total in Acre-feet.
April.....	49.	5.8	19.02	1.19	1.06	906.
May.....	8.9	3.1	3.81	0.238	0.27	234.
June.....	8.9	0.67	1.62	0.101	0.11	96. ①
July.....	1.34	0.58	0.77	.0481	0.055	47. ①
August.....	2.5	0.80	1.16	0.072	0.08	71.
September.....	2.1	1.21	1.34	0.084	0.09	80.
October.....	1.82	1.22	1.54	.096	0.11	95.
November.....	2.3	1.62	1.9	0.119	0.07	57.
The period.....					1.84	1,586.

① Water diverted by Pollock's ditch in June and July not included.

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## AXTON'S WEST DITCH NEAR SOUTH FORK.

This station was established August 12, 1911, by G. R. Elliott, on the irrigation ditch of J. W. E. Axton, which diverts water from Swiftcurrent Creek on the N.E.  $\frac{1}{4}$  Sec. 23, Tp. 7, Rge. 21, W. 3rd Mer. It is located on the N.E.  $\frac{1}{4}$  Sec. 23, about 33 feet below the intake.

The gauge, which is a plain staff graduated to feet and inches, is on the left side of the ditch. The zero (elev. 98.46) is referred to the top of a plug on the left bank (assumed elev. 100.00).

The station is on a uniform cross section of the ditch, which is three feet wide at the bottom, with side slopes of one to one.

The ditch was running from June 17 to July 12, but as no discharge measurements were made, the daily discharge could not be worked out.

During 1912, the gauge was read by J. W. E. Axton.

## DISCHARGE MEASUREMENTS of Axton's West Ditch, near South Fork, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 5 .....	J. S. Wright..				0.62	Nil ①
June 27 .....	do .....					Nil ②
July 30 .....	do .....					Nil ②

① No flow in ditch.

② No flow water standing in pools.

## DAILY GAUGE-HEIGHT IN FEET of Axton's West Ditch, near South Fork, for 1912.

DAY.	June.		July.	
	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1 .....			0.62	
2 .....			0.62	
3 .....			0.62	
4 .....			0.61	
5 .....			0.61	
6 .....			0.64	
7 .....			0.62	
8 .....			0.62	
9 .....			0.62	
10 .....			0.62	
11 .....			0.62	
12 .....			0.62	
13 .....				
14 .....				
15 .....				
16 .....				
17 .....	0.75			
18 .....	0.75			
19 .....	0.73			
20 .....	0.71			
21 .....	0.71			
22 .....	0.69			
23 .....	0.67			
24 .....	0.64			
25 .....	0.62			
26 .....	0.62			
27 .....	0.62			
28 .....	0.62			
29 .....	0.62			
30 .....	0.62			
31 .....				

## AXTON'S, EAST DITCH NEAR SOUTH FORK.

This station was established August 12, 1911, by G. R. Elliott, on the irrigation ditch of J. W. E. Axton, which diverts water from Swiftcurrent Creek on the N.E.  $\frac{1}{4}$  Sec. 23, Tp. 7, Rge. 21, W. 3rd Mer. It is located on the N.E.  $\frac{1}{4}$  Sec. 23, Tp. 7, Rge. 21, W. 3rd Mer., about 40 feet below the intake.

The gauge, which is a plain staff graduated to feet and inches, is on the left side of the ditch. The zero (elev. 97.92) is referred to the top of a plug on the right bank (assumed elev. 100.00).

The station is on a uniform cross-section of the ditch, which is two feet wide at the bottom with perpendicular sides.

The ditch was not used during 1912.

## JONES' COULEE AT READ'S RANCH.

This station was established on September 23, 1909, by H. R. Carscallen. It is located on N.E.  $\frac{1}{4}$  Sec. 5, Tp. 8, Rge. 20, W. 3rd Mer., about 300 yards from the surveyed trail from East End to Gull Lake and about 42 miles south of Gull Lake. It is about eight miles northeast of South Fork post-office, and near the mouth of the stream.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post sunk in the bed of the creek at the left bank and securely stayed. It is referred to bench marks as follows: (1). A spikehead in the top of the final stake driven close to the ground on the right bank and marked "B.M.;" elevation, 8.25 feet above gauge zero. (2). The top of two spikes driven horizontally into the end of a log at the northwest corner of Mr. Read's stable, the log marked "B.M.;" elevation, 11.46 feet above gauge zero.

The channel is straight for 75 feet above and 50 feet below the station. Both banks are high and not liable to overflow. The banks are free from brush except for a little undergrowth on the left bank. The bed of the stream is composed of soft clay with sand underneath. The current is very sluggish and the water comparatively deep at the station, giving rise to a heavy growth of vegetation.

Discharge measurements are made a short distance upstream from the gauge, by wading, and at very low stages a weir is used. The initial point for soundings is a square stake driven close to the ground on the left bank and marked "I.P."

No gauge height observations were taken during 1912, as an observer could not be secured.

## DISCHARGE MEASUREMENTS of Jones' Coulee at Read's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 27 .....	J. S. Wright .....	8.3	7.58	0.20	2.35	1.52
July 30 .....	do .....	9.4	8.89	0.07	2.41	0.63
Sept. 2 .....	do .....	10.1	10.95	0.06	2.55	0.59
Oct. 1 .....	do .....	10.2	10.79	0.08	2.53	0.57
Oct. 30 .....	do .....	10.0	10.34	0.18	2.53	1.92

## JONES' COULEE AT STEARN'S RANCH.

This station was established on May 15, 1912, by J. S. Wright. It is located on N.E.  $\frac{1}{4}$  Sec. 20, Tp. 8, Rge. 20, W. 3rd Mer. It is about 39 miles south of Gull Lake and about 11 miles northeast of South Fork post office.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post sunk in the bed of the stream and securely stayed to the left bank. The zero of the gauge (elev. 93.14) is referred to a permanent iron bench mark (assumed elev. 100.00) located on the right bank about 40 feet west of the gauge.

The channel is straight for 50 feet above and 25 feet below the station. The right bank is high and not liable to overflow. The left bank is low and liable to overflow. The banks are free from brush except for a little undergrowth on the left bank. The bed of the stream is composed of soft clay with sand underneath.

Discharge measurements are generally made by wading a short distance downstream from the gauge, but at very low stages a weir is used. The initial point for soundings is a stake driven close to the ground on the right bank and marked "I.P."

During 1912, the gauge was read by Chas. E. Stearns.

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DISCHARGE MEASUREMENTS of Jones' Coulee at Stearn's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 15.....	J. S. Wright.....	11.7	25.18	0.26	2.045	6.45
June 5.....	do .....	4.1	2.89	0.99	1.11	2.85
June 27.....	do .....	4.1	1.36	0.74	0.77	1.00
July 30.....	do .....	4.2	1.38	0.72	0.74	0.99
Sept. 2.....	do .....	4.3	1.30	0.70	0.74	0.91
Oct. 1.....	do .....	4.7	1.36	0.53	0.74	0.72
Oct. 30.....	do .....	4.5	1.62	0.78	0.74	1.2

DAILY GAUGE-HEIGHT AND DISCHARGE of Jones' Coulee at Stearn's Ranch, for 1912.

DAY.	May.		June.		July.	
	Gauge Height	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge..
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1.40	3.5	0.75	0.95
2.....			1.35	3.3	0.75	0.95
3.....			1.19	2.6	0.75	0.95
4.....			①1.16	2.4	0.83	1.19
5.....			1.13	2.3	1.60	4.4⑤
6.....			1.05	2.0	0.95	1.61
7.....			0.97	1.69	0.85	1.26
8.....			0.94	1.56	0.85	1.26
9.....			0.94	1.56	0.90	1.43
10.....			0.94	1.56	0.87	1.33
11.....			0.88	1.36	0.85	1.26
12.....			0.81	1.13	0.85	1.26
13.....			0.79	1.07	0.84	1.23
14.....			1.66	4.7⑤	0.95	1.61
15.....	2.05	6.5	3.40	12.7	0.84	1.23
16.....	2.08	6.6	2.15	6.9	0.81	1.13
17.....	2.08	6.6	1.56	4.3	0.80	1.10
18.....	1.98	6.1	1.42	3.6	0.79	1.07
19.....	1.90	5.8	1.30	3.0	0.76	0.98
20.....	1.66	4.7	1.17	2.5	0.76	0.98
21.....	1.61	4.4	1.02	1.88	0.75	0.95
22.....	1.60	4.4	0.90	1.43	0.75	0.95
23.....	1.75	5.1	0.90	1.43	0.75	0.95
24.....	①1.62	4.5	0.85	1.26	0.75	0.95
25.....	1.50	3.9	①0.81	1.13	0.75	0.95
26.....	1.41	3.5	0.77	1.01	0.75	0.95
27.....	1.82	5.4	0.77	1.01	0.74	0.92
28.....	2.92	10.5	0.74	0.92	0.74	0.92
29.....	2.05	6.5	0.75	0.95	0.74	0.92
30.....	1.80	5.3	0.75	0.95	0.74	0.92
31.....	1.62	4.5	.....	.....	0.74	0.92

① Gauge height interpolated.

⑤ Rain caused increased discharge.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Jones' Coulee, at Stearn's Ranch, for 1912.

DAY.	August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0.73	0.90	0.75	0.95	0.74	0.92
2	0.76	0.98	0.74	0.92	0.73	0.90
3	0.76	0.98	0.74	0.92	0.73	0.90
4	0.76	0.98	0.74	0.92	0.73	0.90
5	0.77	1.01	0.75	0.95	0.74	0.92
6	0.76	0.98	0.74	0.92	0.74	0.92
7	0.75	0.95	0.74	0.92	0.75	0.95
8	0.74	0.92	0.75	0.95	0.80	1.10
9	0.73	0.90	0.75	0.95	1.05	2.0
10	0.74	0.92	0.74	0.92	0.93	1.54
11	0.74	0.92	0.74	0.92	0.85	1.26
12	0.75	0.95	0.74	0.92	0.80	1.10
13	0.75	0.95	0.75	0.95	0.78	1.04
14	0.74	0.92	0.75	0.95	0.75	0.95
15	0.73	0.90	0.74	0.92	0.75	0.95
16	0.96	1.65	0.73	0.90	0.74	0.92
17	0.80	1.10	0.73	0.90	0.75	0.95
18	0.78	1.04	0.73	0.90	0.84	1.23
19	0.77	1.01	0.74	0.92	0.81	1.13
20	0.76	0.98	0.74	0.92	0.79	1.07
21	0.74	0.92	0.75	0.95	0.75	0.95
22	0.73	0.90	0.75	0.95	0.79	1.07
23	0.70	0.82	0.74	0.92	0.76	0.98
24	0.73	0.90	0.74	0.92	0.76	0.98
25	0.76	0.98	0.74	0.92	0.76	0.98
26	0.76	0.98	0.74	0.92	0.75	0.95
27	0.85	1.26	0.73	0.90	0.75	0.95
28	0.80	1.10	0.73	0.90	0.75	0.95
29	0.78	1.04	0.73	0.90	0.75	0.95
30	0.75	0.95	0.74	0.92	0.74	0.92
31	0.75	0.95			0.75	0.95

① Gauge height interpolated.

② Rain caused increased discharge.

## MONTHLY DISCHARGE of Jones' Coulee at Chas. E. Stearn's Ranch, for 1912.

(Drainage area 23 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Persquare Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May (15-31).....	10.5	3.5	5.55	0.241	0.15	188.
June.....	12.7	0.92	2.52	0.109	0.12	150.
July.....	4.4	0.92	1.21	0.053	0.06	74.
August.....	1.65	0.82	0.991	0.043	0.05	61.
September.....	0.95	0.90	0.924	0.040	0.04	55.
October.....	2.0	0.90	1.04	0.045	0.05	62.
The period.....					0.47	590.

## SWIFTCURRENT CREEK AT SINCLAIR'S RANCH. (Upper Station.)

This station was established June 15, 1910, by R. G. Swan. It is located on the S.E.  $\frac{1}{4}$  Sec. 18, Tp. 10, Rge. 19, W. 3rd. Mer., about 150 feet upstream from the mouth of Bone Creek, and about 1200 feet above the lower station.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the right bank. The zero (elev. 87.86) is referred to a permanent iron bench mark (assumed elev. 100.00) located 300 feet S.  $61.5^{\circ}$  W. of the gauge.

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The channel is straight for about 250 feet above and 150 feet below the station. Both banks are fairly high, and covered with a growth of brush. Neither bank will overflow. The bed of the stream is composed of sand which will shift.

Discharge measurements are made at the station by wading. The initial point for soundings is a plug on the left bank about four inches above ground and 45 feet from the gauge. During high stages the gauge heights at this station are affected by backwater from Bone Creek.

During 1912, the gauge was read by Mrs. K. Sinclair.

## DISCHARGE MEASUREMENTS of Swiftcurrent Creek at Sinclair's Ranch, (Upper Station) in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 6.....	J. S. Wright.....	15.5	11.26	0.96	..... ①	10.86
June 28.....	do .....	14.0	8.63	.31	0.675	2.65
July 31.....	do .....	10.6	3.72	.36	.59	1.35
Sept. 3.....	do .....	11.3	5.06	.78	.72	3.93
Oct. 4.....	do .....	10.7	4.79	.46	.66	2.20
Oct. 31.....	do .....	12.0	6.49	.94	.80	6.07

① No gauge.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Swiftcurrent Creek, at Sinclair's Ranch, (Upper Station) for 1912.

DAY.	June.		July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			0.75	4.5	0.57	1.14	0.73	4.0	0.70	3.2	0.85	7.9
2.....			0.76	4.8	0.57	1.14	0.73	4.0	0.70	3.2	0.85	7.9
3.....			0.75	4.5	0.60	1.50	0.72	3.7	0.70	3.2	0.88	9.0
4.....			0.70	3.2	0.64	2.1	0.72	3.7	0.69	3.0	0.89	9.4
5.....			0.70	3.2	0.70	3.2	0.73	4.0	0.68	2.8	0.85	7.9
6.....			0.72	3.7	0.71	3.5	0.72	3.7	0.68	2.8	0.80	6.1
7.....			0.75	4.5	0.71	3.5	0.72	3.7	0.67	2.6	0.82	6.8
8.....			0.77	5.1	0.70	3.2	0.70	3.2	0.69	3.0	0.82	6.8
9.....			0.77	5.1	0.67	2.6	0.70	3.2	0.79	5.8	0.80	6.1
10.....			0.78	5.4	0.65	2.2	0.70	3.2	0.81	6.5	0.81	6.5
11.....			0.78	5.4	0.67	2.6	0.70	3.2	0.81	7.5	0.80	6.1
12.....			0.79	5.8	0.69	3.0	0.69	3.0	0.85	7.9	0.77	5.1
13.....			0.79	5.8	0.70	3.2	0.68	2.8	0.85	7.9	0.75	4.5
14.....			0.78	5.4	0.71	3.5	0.69	3.0	0.82	6.8	0.72	3.7
15.....			0.77	5.1	0.71	3.5	0.73	4.0	0.80	6.1	0.72	3.7
16.....			0.77	5.1	0.72	3.7	0.72	3.7	0.75	4.5		
17.....			0.76	4.8	0.73	4.0	0.70	3.2	0.71	3.5		
18.....			0.75	4.5	0.74	4.3	0.70	3.2	0.72	3.7		
19.....			0.75	4.5	0.75	4.5	0.70	3.2	0.73	4.0		
20.....			0.75	4.5	0.74	4.2	0.71	3.5	0.73	4.0		
21.....			0.74	4.2	0.73	4.0	0.71	3.5	0.77	5.1		
22.....			0.72	3.7	0.72	3.7	0.72	3.7	0.79	5.8		
23.....			0.71	3.5	0.72	3.7	0.71	3.5	0.75	4.5		
24.....			0.70	3.2	0.70	3.2	0.71	3.5	0.72	3.7		
25.....			0.67	2.6	0.69	3.0	0.70	3.2	0.70	3.2		
26.....			0.65	2.2	0.68	2.8	0.70	3.2	0.70	3.2		
27.....			0.65	2.2	0.71	3.5	0.70	3.2	0.70	3.2		
28.....	①0.70	3.2	0.64	2.1	0.72	3.7	0.71	3.5	0.71	3.5		
29.....	0.70	3.2	0.63	1.92	0.73	4.0	0.70	3.2	0.70	3.2		
30.....	0.72	3.7	0.61	1.64	0.75	4.5	0.70	3.2	0.70	3.2		
31.....			0.59	1.38	0.73	4.0			0.80	6.1		

① Gauge was taken out by spring freshet and was not re-established until June 28.



MONTHLY DISCHARGE of Swiftcurrent Creek at Sinclair's Ranch, (Upper Station), for 1912.

(Drainage area 149 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June (28-30).....	3.7	3.2	3.37	0.023	0.002	20.
July.....	5.8	1.38	3.99	0.027	0.03	240.
August.....	4.5	1.14	3.24	0.022	0.025	199.
September.....	4.0	2.8	3.43	0.023	0.026	204.
October.....	7.9	2.6	4.41	0.030	0.035	271.
November (1-15).....	9.4	3.7	6.50	0.044	0.025	193.
The period.....					0.143	1,127.

#### BONE CREEK AT LEWIS' RANCH.

This station was established July 2, 1908, by F. T. Fletcher. It is located at the highway bridge on Sec. 34, Tp. 8, Rge. 22, W. of the 3rd Mer. It is on the surveyed trail from Skull Creek post office to East End post office and is about fifteen miles by trail south of Skull Creek post office. The bridge is a small wooden structure, built in the form of a culvert, with a rectangular cross-section.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to the left abutment on the upstream side of the bridge. The zero of the gauge (elev. 95.02) is referred to a permanent iron bench mark (assumed elev. 100.00) sunk in the right bank, about 62 feet southwest of the gauge.

The channel is straight for 50 feet above the station; below the station it curves gradually to the left after emerging from the downstream side of the bridge. The right bank is high and will not overflow; the left bank is comparatively low, but no indication of the water overflowing the bank can be found. Both banks are free from brush at the station. The bed of the stream is sardy, with some large stones scattered along the cross-section. The current is moderate, becoming very swift below the station.

Discharge measurements are made from the upstream side of the bridge during high water. The initial point for soundings is the inner face of the left abutment. Low-water measurements are made near the station by wading.

During 1912, the gauge was read by C. L. Lewis.

#### DISCHARGE MEASUREMENTS of Bone Creek at Lewis' Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Apr. 23.....	G. H. Whyte.....	4.4	2.01	1.81	0.38	3.64
June 4.....	J. S. Wright.....	5.3	2.69	1.10	.23	2.93
June 25.....	do.....	5.2	2.30	0.65	.25	1.49
July 26.....	do.....	5.3	2.25	.81	.14	1.83
Aug. 22.....	do.....	5.5	2.34	.59	.13	1.38
Sept. 23.....	do.....	5.9	2.67	.71	.17	1.70
Oct. 28.....	do.....	5.5	2.63	.62	.20	1.63

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DAILY GAUGE-HEIGHT AND DISCHARGE OF Bone Creek at Lewis' Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	.39	4	.37	4.0	.35	5.7	.23	1.56
2.....	.94	27	.39	4.5	.34	5.5	.23	1.62
3.....	.97	28	.39	4.6	.34	5.6	.22	1.55
4.....	1.34	54	.40	4.9	.23	3.0	.22	1.60
5.....	1.38	56	.40	5.0	.27	3.7	.22	1.66
6.....	.74	16	.41	5.3	.27	3.6	.24	1.98
7.....	1.35	54	.42	5.7	.26	3.3	.23	1.90
8.....	2.29	118	.41	5.5	.26	3.2	.23	1.98
9.....	2.22	114	.42	5.9	.26	3.1	.24	2.2
10.....	2.67	144	.41	5.7	.26	3.0	.24	2.20
11.....	2.77	150	.38	4.9	.25	2.7	.23	2.2
12.....	1.15	41	.37	4.7	.25	2.6	.22	2.1
13.....	.72	15.2	.36	4.6	.25	2.5	.23	2.3
14.....	.77	17.6	.36	4.6	.32	3.8	.21	2.1
15.....	.84	21	.37	5.0	.63	12.4	.21	2.1
16.....	.69	13.6	.37	5.0	.28	2.8	.20	2.0
17.....	1.12	39	.36	4.8	.27	2.5	.20	2.1
18.....	.70	14	.36	4.9	.27	2.4	.20	2.2
19.....	1.57	70	.37	5.2	.25	2.0	.20	2.2
20.....	.53	7.6	.36	5.0	.25	1.8	.20	2.3
21.....	.52	7.4	.36	5.1	.22	1.46	.20	2.4
22.....	.47	6.0	.37	5.5	.21	1.28	.20	2.5
23.....	1.38	3.6 <sup>①</sup>	.37	5.6	.20	1.14	.20	2.5
24.....	.39	4.0	.36	5.4	.21	1.16	.20	2.6
25.....	.47	6.1	.35	5.2	.25	1.49	.20	2.7
26.....	.45	5.6	.36	5.5	.23	1.33	.14	1.83
27.....	.42	4.9	.60	11.6	.22	1.27	.14	1.82
28.....	.40	4.5	.70	13.7	.22	1.31	.14	1.8
29.....	.37	3.8	.44	8.2	.21	1.25	.15	1.93
30.....	.37	3.9	.37	6.1	.22	1.40	.14	1.78
31.....			.36	5.9			.15	1.90

<sup>①</sup> Shifting conditions from April<sup>23</sup> to October 28.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Bone Creek at Lewis' Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	.15	1.89	.15	1.68	.17	1.76	.18	1.34
2.....	.15	1.88	.14	1.53	.17	1.69	.18	1.34
3.....	.14	1.73	.15	1.68	.17	1.69	.18	1.34
4.....	.15	1.85	.14	1.53	.17	1.69	.18	1.34
5.....	.14	1.71	.15	1.68	.17	1.69	.19	1.48
6.....	.15	1.83	.14	1.53	.17	1.62	.20	1.63
7.....	.16	1.95	.16	1.78	.17	1.62	.21	1.80
8.....	.16	1.94	.16	1.78	.17	1.62	.20	1.63
9.....	.13	1.54	.15	1.68	.14	1.88	.20	1.63
10.....	.14	1.65	.15	1.68	.18	1.67	.17	1.21
11.....	.13	1.52	.16	1.78	.17	1.55	.17	1.21
12.....	.12	1.40	.17	1.90	.17	1.55	.18	1.34
13.....	.11	1.29	.17	1.90	.17	1.55	.18	1.34
14.....	.10	1.18	.17	1.90	.17	1.48	.17	1.21
15.....	.10	1.17	.19	2.20	.17	1.48	.17	1.21
16.....	.14	1.57	.21	2.50	.17	1.48	.....	.....
17.....	.14	1.56	.17	1.90	.17	1.48	.....	.....
18.....	.15	1.66	.17	1.90	.18	1.53	.....	.....
19.....	.14	1.53	.18	2.00	.19	1.65	.....	.....
20.....	.14	1.52	.17	1.90	.18	1.53	.....	.....
21.....	.14	1.51	.17	1.90	.18	1.53	.....	.....
22.....	.13	1.38	.17	1.90	.18	1.46	.....	.....
23.....	.14	1.49	.17	1.90	.18	1.46	.....	.....
24.....	.14	1.50	.17	1.84	.19	1.58	.....	.....
25.....	.14	1.51	.17	1.84	.18	1.46	.....	.....
26.....	.15	1.60	.17	1.84	.18	1.45	.....	.....
27.....	.18	2.00	.17	1.84	.18	1.45	.....	.....
28.....	.15	1.63	.17	1.76	.20	1.65	.....	.....
29.....	.15	1.64	.17	1.76	.18	1.34	.....	.....
30.....	.15	1.65	.17	1.76	.18	1.34	.....	.....
31.....	.14	1.52	.....	.....	.18	1.34	.....	.....

① Shifting conditions from April 23 to Oct. 28.

## MONTHLY DISCHARGE of Bone Creek at Lewis' Ranch, for 1912.

(Drainage area 17 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Persquare Mile.	Depth in Inches on Drainage Area.	Total in Acre-feet.
April (1-30).....	144.	3.6	35.13	2.07	2.31	2,090.
May.....	13.7	4.0	5.73	0.338	0.39	352.
June.....	12.4	1.14	2.94	0.176	0.20	175.
July.....	2.7	1.55	2.05	0.122	0.14	126.
August.....	2.0	1.17	1.61	0.065	0.11	99.
September.....	2.5	1.53	1.82	0.107	0.12	108.
October.....	1.88	1.34	1.56	0.092	0.11	96.
November (1-15).....	1.80	1.21	1.41	0.083	0.05	42.
The period.....	.....	.....	.....	.....	3.43	3,088.

## SWIFTCURRENT CREEK AT SINCLAIR'S RANCH. (Lower Station.)

This station was established on May 27, 1910, by H. R. Carscallen. It is located in the S.W.  $\frac{1}{4}$  Sec. 17, Tp. 10, Rge. 19, W. 3rd Mer., at the highway bridge on the surveyed trail from East End to Gull Lake, and just below the mouth of Bone Creek.

The gauge is of the standard chain type. The box is nailed securely to the downstream side of the floor of the bridge. The length of chain from bottom of weight to marker is 21.2

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feet. The zero (elev. 84.83) is referred to a permanent iron bench mark (assumed elev. 100.00) located on the right bank 600 feet upstream from the bridge.

The channel is straight for 75 feet above and 20 feet below the station. The left bank has a gradual slope, is high and well wooded. The right bank rises abruptly; it is also high and well wooded. The stream bed is sandy in character, free from vegetation and liable to shift at high water. The current at this point is sluggish.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the inner face of the left abutment. Low water measurements are made by wading at a point about 100 feet upstream.

During 1912, the gauge was read by Mrs. K. Sinclair.

## DISCHARGE MEASUREMENTS of Swiftcurrent Creek at Sinclair's Rancho (Lower Station), for 1912

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 16 . . . . .	J. S. Wright . . . . .	19.0	44.4	1.25	4 01	55 27
June 6 . . . . .	do . . . . .	17.1	37.14	0.92	3 50	33.97
June 28 . . . . .	do . . . . .	17 0	23.1	0.49	2 87	11 61
July 31 . . . . .	do . . . . .	22.	11.78	.42	2.74	4.90
Sept. 3 . . . . .	do . . . . .	20 2	11.04	1.13	2.84	12.53
Oct. 3 . . . . .	do . . . . .	24 3	13.91	1.11	2.97	15.5
Oct. 31 . . . . .	do . . . . .	25 0	24 13	1.18	3.39	28.42

## DAILY GAUGE-HEIGHT AND DISCHARGE of Swiftcurrent Creek at Sinclair's Ranch, (Lower Station), for 1912.

DAY.	May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec. ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1 . . . . .			3 92	52 0	2 75	8 5
2 . . . . .			3 88	50 0	2 75	8 5
3 . . . . .			3 76	45 0	2 75	8 5
4 . . . . .			3 65	40 0	2 97	14 6
5 . . . . .			3 53	35 0	2 95	14 0
6 . . . . .			3 49	31 0	3 00	15 5
7 . . . . .			3 45	32 0	3 05	17 1
8 . . . . .			3 40	30 0	3 10	18 8
9 . . . . .			3 38	29 0	3 13	20 0
10 . . . . .			3 30	26 0	3 13	20 0
11 . . . . .			3 30	26 0	3 15	20 0
12 . . . . .			3 30	26 0	3 17	21 0
13 . . . . .			3 35	28 0	3 17	21 0
14 . . . . .			3 50	34 0 ①	3 16	21 0
15 . . . . .			6 00	147 0	3 15	20 0
16 . . . . .	4 01	55 0	5 10	105 0	3 15	20 0
17 . . . . .	3 99	55 0	5 00	100 0	3 13	20 0
18 . . . . .	4 00	55 0	4 55	79 0	3 10	18 8
19 . . . . .	3 96	53 0	4 10	59 0	3 09	18 4
20 . . . . .	3 91	51 0	3 75	44 0	3 07	17 9
21 . . . . .	4 00	55 0	3 40	30 0	3 05	17 1
22 . . . . .	4 42	73 0	3 25	24 0	3 03	16 4
23 . . . . .	4 46	75 0	3 15	20 0	3 02	16 1
24 . . . . .	4 46	75 0	3 15	20 0	3 00	15 5
25 . . . . .	4 43	74 0	3 00	15 5	3 60	38 0
26 . . . . .	4 37	71 0	2 97	14 6	3 20	22 0
27 . . . . .	5 17	108 0 ①	2 90	12 0	2 80	12 3
28 . . . . .	5 72	134 0	2 80	9 8	2 88	12 0
29 . . . . .	5 46	122 0	2 80	9 8	2 86	11 5
30 . . . . .	5 21	110 0	2 75	8 5	2 79	9 5
31 . . . . .	5 29	114 0	.....	.....	2 78	9 3

① Rain.

② No observer previous to this date.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Swiftcurrent Creek at Sinclair's Ranch, (Lower Station), for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.70	7.3	2.87	11.8	3.02	16.1	3.39	30
2.....	2.69	7.1	2.88	12.0	3.01	15.8	3.42	31
3.....	2.72	7.8	2.84	10.9	3.00	15.5	3.59	38
4.....	2.75	8.5	3.00	15.5	2.99	15.2	3.60	38
5.....	2.80	9.8	3.00	15.5	2.99	15.2	3.60	38
6.....	2.79	9.5	3.01	15.8	3.01	15.8	3.58	37
7.....	2.80	9.8	3.02	16.1	3.02	16.1	3.59	38
8.....	2.79	9.5	3.00	15.5	3.04	16.8	3.57	37
9.....	2.80	9.8	2.98	14.9	3.37	29	3.54	36
10.....	2.80	9.8	2.96	14.3	3.38	29	3.48	33
11.....	2.81	10.1	2.93	13.4	3.39	30	3.39	30
12.....	2.82	10.4	2.90	12.6	3.44	32	3.44	32
13.....	2.82	10.4	2.88	12.0	3.43	31	3.40	30
14.....	2.82	10.4	2.88	12.0	3.36	28	3.36	28
15.....	2.83	10.6	3.01	15.8	3.29	26	3.39	30
16.....	2.83	10.6	3.02	16.1	3.24	24	.....	.....
17.....	2.83	10.6	3.01	15.8	3.14	20	.....	.....
18.....	2.84	10.9	3.01	15.8	3.16	21	.....	.....
19.....	2.84	10.9	3.00	15.5	3.19	22	.....	.....
20.....	2.89	12.3	3.01	15.8	3.24	24	.....	.....
21.....	2.89	12.3	3.01	15.8	3.34	28	.....	.....
22.....	2.86	11.5	3.01	15.8	3.39	30	.....	.....
23.....	2.84	10.9	3.02	16.1	3.34	28	.....	.....
24.....	2.83	10.6	3.04	16.8	3.28	25	.....	.....
25.....	2.83	10.6	3.03	16.4	3.28	25	.....	.....
26.....	2.82	10.4	3.03	16.4	3.26	24	.....	.....
27.....	2.83	10.6	3.04	16.8	3.24	24	.....	.....
28.....	2.83	10.6	3.05	17.1	3.26	24	.....	.....
29.....	2.84	10.9	3.05	17.1	3.29	26	.....	.....
30.....	2.86	11.5	3.04	16.8	3.30	26	.....	.....
31.....	2.86	11.5	.....	.....	3.39	30	.....	.....

## MONTHLY DISCHARGE of Swiftcurrent Creek at Sinclair's Ranch, (Lower Station), for 1912.

(Drainage area 366 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in Inches on Drainage Area.	Total in Acre-feet.
May (16-31).....	134.	51.	80.0	0.218	0.13	2,539.
June.....	147.	8.5	39.4	0.108	0.12	2,344.
July.....	38.	8.5	16.9	0.046	0.05	1,039.
August.....	12.3	7.1	10.2	0.028	0.03	627.
September.....	17.1	10.9	15.1	0.041	0.05	890.
October.....	32.	15.2	23.6	0.064	0.07	1,451.
November (1-15).....	38.	28.	33.7	0.092	0.05	1,002.
The period.....	.....	.....	.....	.....	0.50	9,901.

## SWIFTCURRENT CREEK AT SWIFT CURRENT.

This station was established April 30, 1910, by H. R. Carscallen. It is located at the traffic bridge on the north side of the Canadian Pacific Railway tracks in the town of Swift Current on S.W.  $\frac{1}{4}$  Sec. 30, Tp. 15, Rge. 13, W. 3rd Mer.

The gauge is a plain staff, graduated to feet and hundredths, spiked vertically to the inside face of the left abutment of the bridge. The zero of the gauge (elev. 85.71) is referred to a permanent iron bench mark (assumed elev. 100.00), situated eight feet east of the south approach of the bridge.

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The channel curves slightly, but is almost straight for about 300 feet above the station and is straight for about 300 feet below. The right bank is rather low, with a gradual slope; the left bank is high. Both banks are clear of brush and undergrowth and are not liable to overflow. The bed of the stream is sandy, with a few large stones and is liable to shift at high stages. Weeds in the cross-section make it difficult to make discharge measurements during low stages of the stream, when the current is sluggish.

During ordinary stages, discharge measurements are made from the downstream side of the bridge, but at low stages they are made by wading near the bridge. The initial point for soundings is the inner face of the row of piles at the end of the south approach.

During 1912 the gauge was read by C. E. Wesley, who lives within 200 yards of the bridge.

## DISCHARGE MEASUREMENTS of Swiftcurrent Creek, at Swiftcurrent, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 18.....	D. D. MacLeod.....	76	208.3	1.64	3.16	342.33
April 30.....	do.....	75	148.0	1.18	2.135	174.56
May 18.....	do.....	72	116.5	0.88	1.69	104.18
May 28.....	do.....	75	151.4	1.09	2.07	164.59
June 20.....	H. D. S. A. Smith.....	73	126.2	0.93	1.78	118.40
July 2.....	do.....	70	94.0	0.50	1.66	46.93
July 17.....	do.....	69	88.4	0.45	1.62	42.93
Aug. 7.....	do.....	67.5	72.9	0.28	1.36	20.72
Aug. 23.....	do.....	67.5	77.6	0.41	1.40	30.76
Sept. 3.....	do.....	68	83.4	0.37	1.43	30.74
Sept. 20.....	do.....	68	82.2	0.40	1.49	33.00
Oct. 1.....	do.....	67	77.1	0.23	1.55	17.76
Oct. 14.....	do.....	72	89.9	0.49	1.66	44.44
Oct. 30.....	do.....	68	88.4	0.46	1.64	40.70
Nov. 16.....	do.....	71	101.6	0.22	1.90	22.80
Dec. 27.....	do.....	70	44.7	0.19	1.00	8.48

## DAILY GAUGE-HEIGHT AND DISCHARGE of Swiftcurrent Creek, at Swiftcurrent, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	5.0	①	2.10	100	2.10	169	1.40	39
2.....	5.9		2.00	153	1.90	137	1.30	26
3.....	6.9		2.10	169	1.80	122	1.30	26
4.....	8.7		2.10	169	1.70	106	1.40	28
5.....	10.1		2.10	169	1.70	106	1.40	28
6.....	10.3		2.10	169	1.70	106	1.40	28
7.....		②	2.10	169	1.60	90	1.40	28
8.....			2.10	169	1.60	90	1.40	28
9.....			2.00	153	1.60	90	1.40	28
10.....			2.00	153	1.60	90	1.30	26
11.....			2.00	153	1.60	90	1.40	28
12.....			1.90	137	1.50	76	1.40	28
13.....			1.90	137	1.50	76	1.40	28
14.....			1.80	122	1.50	76	1.40	28
15.....			1.80	122	1.50	76	1.40	28
16.....			1.80	122	1.60	90	1.40	28
17.....			1.70	106	1.70	106	1.40	28
18.....			1.70	106	2.10	169	1.30	26
19.....			1.80	122	2.00	153	1.30	26
20.....			1.70	106	1.90	137	1.30	26
21.....	2.95	3.08	1.70	106	1.80	117	1.30	26
22.....	2.85	2.90	1.70	106	1.80	117	1.30	26
23.....	2.75	2.74	1.70	106	1.60	78	1.30	26
24.....	2.65	2.58	1.70	106	1.50	60	1.30	26
25.....	2.65	2.58	1.60	90	1.50	56	1.30	26
26.....	2.55	2.42	1.60	90	1.40	39	1.20	24
27.....	2.55	2.42	1.80	122	1.30	26	1.20	24
28.....	2.45	2.26	2.10	169	1.30	26	1.10	23
29.....	2.45	2.26	2.00	153	1.30	26	1.10	23
30.....	2.45	2.26	2.00	153	1.40	39	1.10	23
31.....			2.00	153			1.10	23

① Ice running in creek.

② Gauge carried away. Replaced April 21.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Swiftcurrent Creek at Swift Current, for 1912.

DAY.	August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	1.10	23	1.46	30	1.51	33	1.96	85	1.26	13.0
2.	1.10	23	1.46	30	1.51	33	1.96	85	1.91	22.9
3.	1.10	23	1.46	30	1.51	33	1.96	85	1.21	12.2
4.	1.10	23	1.46	30	1.51	33	1.66	45	1.21	12.2
5.	1.10	23	1.51	33	1.56	36	1.56	36	1.16	10.3
6.	1.10	23	1.46	30	1.56	36	1.56	36	1.16	10.3
7.	1.06	22	1.46	30	1.56	36	1.56	36	1.16	10.3
8.	1.06	22	1.46	30	1.56	36	1.46	31	1.16	10.3
9.	1.06	22	1.41	28	1.61	40	1.56	36	1.16	10.3
10.	1.06	22	1.46	30	1.66	45	1.66	45	1.21	12.2
11.	1.06	22	1.56	36	1.71	50	1.56	36	1.21	12.2
12.	1.06	22	1.46	30	1.66	45	1.46	31	1.21	12.2
13.	1.06	22	1.41	28	1.66	45	1.46	31	1.21	12.2
14.	1.06	22	1.46	30	1.66	45	1.56	36	1.21	12.2
15.	1.06	22	1.36	27	1.66	45	1.56	36	1.31	13.9
16.	1.16	23	1.41	28	1.66	45	1.66	21	1.31	13.9
17.	1.16	23	1.41	28	1.66	45	1.51	20	1.21	12.2
18.	1.16	23	1.36	27	1.66	45	1.66	21	1.21	12.2
19.	1.16	23	1.36	27	1.66	45	1.66	21	1.21	12.2
20.	1.16	23	1.46	30	1.66	45	1.66	20	1.06	9.7
21.	1.16	23	1.46	30	1.66	45	1.76	21.3	1.06	9.7
22.	1.16	23	1.46	30	1.66	45	1.66	19.7	1.06	9.7
23.	1.36	27	1.46	30	1.61	40	1.66	19.7	1.06	9.7
24.	1.46	30	1.46	30	1.61	40	1.66	19.7	1.06	9.7
25.	1.46	30	1.46	30	1.61	40	1.61	18.9	1.06	9.7
26.	1.41	28	1.46	30	1.61	40	1.61	18.9	1.06	9.7
27.	1.34	27	1.46	30	1.56	36	1.56	18.0	1.06	9.7
28.	1.31	26	1.46	30	1.56	36	1.51	17.2	1.06	9.7
29.	1.46	30	1.41	28	1.56	36	1.41	15.5	1.06	9.7
30.	1.46	30	1.41	28	1.56	36	1.56	14.7	1.06	9.7
31.	1.46	30			2.16	119			1.06	9.7

Daily discharges from Nov. 15 to Dec. 31 are very approximate.

## MONTHLY DISCHARGE of Swiftcurrent River at Swift-Current, for 1912.

(Drainage area 1015 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
April (21-30).....	308.	226.	255.	0.251	0.09	5,058
May.....	169.	90.	136.4	0.134	0.15	8,287
June.....	169.	26.	91.3	0.09	0.10	5,433
July.....	39.	23.	26.7	0.026	0.03	1,612
August.....	30.	22.	24.3	0.024	0.03	1,294
September.....	36.	27.	29.6	0.029	0.03	1,761
October.....	119.	33.	42.9	0.042	0.05	2,638
November ①.....	85.	14.7	32.6	0.032	0.04	1,940
December ①.....	22.9	9.7	11.4	0.011	0.01	701
The period.....					0.53	29,054

① Records during ice conditions (Nov. 15 to Dec. 31) are only estimates, with a fair degree of accuracy.

ANTELOPE LAKE DRAINAGE BASIN.

*Description.*

Antelope Lake is a small body of saline water, six miles long, and from one to one and a half miles wide, at an elevation of 2,300 feet above sea level. It lies in a deep depression north of the main line of the Canadian Pacific Railway, in Tp. 15, Rge. 18, W. 3rd Mer., and drains an area of about 350 square miles.

The lake receives its supply from Bridge Creek, which rises in the Cypress Hills. The altitude of the source of this creek is 2,800 feet and it has an average fall of fifteen feet per mile.

The valley traversed by Bridge Creek is narrow and quite shallow, rarely exceeding 100 feet in depth. The land lying along the creek bottom is very flat and liable to become inundated during periods of flood. The bench land is rolling prairie, cut up by innumerable coulees which drain the surrounding country into the main valley.

The mean annual rainfall amounts to about fourteen inches, most of which occurs during May, June and July. The creek has only a small flow, and is dry along most of its course for several months during the year.

A number of irrigation schemes receive their supply from this basin. The largest of these are Moorhead and Fearon's works, which divert water from Bridge Creek in Sec. 33, Tp. 10, Rge. 22, W. 3rd Mer.

BRIDGE CREEK NEAR RAYMOND'S RANCH.

This station was established April 8, 1911, by G. H. Whyte. It is located on the S.E.  $\frac{1}{4}$  Sec. 33, Tp. 10, Rge. 22, W. 3rd Mer., and about 400 yards upstream from the headgate of Fearon and Moorhead's ditch and some two miles from Skull Creek post office.

The gauge, which is a plain staff graduated to feet and hundredths, is placed at the left side of the channel. The zero of the gauge (elev. 89.42) is referred to a permanent iron bench mark (assumed elev. 100.00), located on the left bank about 50 feet southwest of the gauge.

The channel is straight for about 30 feet above and below the station. The right bank is low and covered with small shrubs, while the left is high and clear of tree growth. The bed of the stream is sandy and shifting. The current is moderate at all stages.

Discharge measurements are made at the gauge by wading, or during high stages at the government bridge three miles below. During most of the season, however, measurements are made with a weir at or near the gauge. The initial point for sounding is a plug driven close to the ground on the left bank, and a tagged wire is strung across the stream to mark the regular section.

During 1912, the gauge was read by Mrs. Charles Raymond.

DISCHARGE MEASUREMENTS of Bridge Creek at Raymond's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 20. . . . .	G. H. Whyte. . . . .	4.2	2.78	0.64	0.90	1.77
June 3. . . . .	J. S. Wright. . . . .	4.7	2.45	0.37	0.73	0.91
June 24. . . . .	do . . . . .				.68	.31①
July 24. . . . .	do . . . . .				.67	.34①
Aug. 20. . . . .	do . . . . .				.61	.35①
Sept. 21. . . . .	do . . . . .				.66	.27①
Oct. 24. . . . .	do . . . . .				.68	.44①
Nov. 24. . . . .	do . . . . .				.65	.51①

①Weir used.



## DAILY GAUGE-HEIGHT AND DISCHARGE of Bridge Creek, at Raymond's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0.98	2 3	0.88	1.65	0.78	1.09	0.67	0.34
2	1.08	3 0	.95	2.1	.73	0.85	.67	.34
3	1.08	3 0	.87	1.59	.73	.91	.67	.34
4	1.03	2 7	.88	1.65	.72	.85	.67	.34
5	1.58	7 2	.88	1.65	.70	.75	.67	.34
6	1.08	3 0	1.08	3 0	.67	.64	.67	.34
7	1.68	8 0	1.08	3 0	.67	.62	.67	.34
8	1.93	10 1	0.98	2.3	.67	.60	.65	.28
9	1.65	7 7	.88	1.65	.64	.44	.65	.28
10	1.65	7 7	.83	1 36	.62	.35	.64	.26
11	1.53	6 7	.80	1 19	.62	.34	.64	.26
12	1.43	5 9	.78	1.09	.62	.32	.67	.34
13	1.06	2 9	.78	1.09	.57	.20	.65	.28
14	1.18	3 8	.78	1.09	.82	1.08	.65	.28
15	1.08	3 0	.73	0 85	1.57	6.80	.65	.28
16	1.08	3 0	.73	.85	1.07	2.56	.67	.34
17	1.03	2 7	.73	.85	.87	1.23	.69	.40
18	1.01	2 5	.73	.85	.82	0.96	.69	.40
19	0.94	2 0	.73	.85	.80	.82	.69	.40
20	.90	1 77	.71	.76	.80	.78	.69	.40
21	.94	2 0	.68	.63	.68	.31	.67	.34
22	.94	2 0	.73	.85	.70	.43	.67	.34
23	.94	2 0	.73	.85	.70	.43	.67	.34
24	.91	1 83	.73	.85	.67	.34	.67	.34
25	.88	1.65	.72	.81	.67	.34	.61	.20
26	.80	1.19	.73	.85	.67	.34	.61	.20
27	.80	1.19	1.88	9 7	.67	.34	.55	.10
28	.78	1.09	1.58	7 2	.65	.28	.53	.07
29	.78	1.09	0.88	1.65	.65	.28	.50	.04
30	.88	1.65	.83	1.36	.65	.28	.50	.04
31			.81	1.25			.49	.04

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DAILY GAUGE-HEIGHT AND DISCHARGE of Bridge Creek, at Raymond's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.50	0.05	0.65	0.38	0.64	0.26	0.64	0.37
2.....	.50	.05	.61	.26	.63	.24	.65	.40
3.....	.55	.12	.61	.26	.63	.24	.66	.45
4.....	.60	.23	.62	.27	.63	.25	.65	.42
5.....	.60	.23	.64	.32	.64	.27	.65	.42
6.....	.60	.24	.65	.34	.62	.22	.66	.46
7.....	.58	.20	.66	.37	.63	.25	.65	.43
8.....	.55	.15	.64	.30	.63	.26	.66	.46
9.....	.55	.15	.62	.25	.65	.31	.65	.44
10.....	.57	.20	.62	.24	.65	.31	.65	.44
11.....	.60	.26	.61	.21	.66	.33	.65	.44
12.....	.65	.41	.61	.20	.67	.38	.64	.43
13.....	.63	.36	.60	.18	.68	.40	.63	.40
14.....	.60	.28	.66	.31	.67	.38	.64	.43
15.....	.58	.24	.66	.31	.67	.38	.65	.48
16.....	.60	.30	.65	.27	.68	.41	.....	.....
17.....	.60	.30	.64	.24	.68	.41	.....	.....
18.....	.63	.40	.63	.21	.69	.45	.....	.....
19.....	.60	.31	.64	.23	.69	.45	.....	.....
20.....	.61	.35	.64	.23	.70	.50	.....	.....
21.....	.60	.31	.66	.27	.69	.47	.....	.....
22.....	.58	.26	.65	.26	.68	.44	.....	.....
23.....	.58	.25	.64	.24	.68	.44	.....	.....
24.....	.59	.27	.64	.24	.68	.44	.....	.....
25.....	.60	.29	.63	.21	.66	.40	.....	.....
26.....	.61	.31	.63	.22	.66	.40	.....	.....
27.....	.66	.44	.64	.25	.67	.43	.....	.....
28.....	.65	.41	.64	.25	.66	.42	.....	.....
29.....	.67	.46	.65	.28	.65	.39	.....	.....
30.....	.68	.50	.64	.26	.64	.36	.....	.....
31.....	.66	.41	.....	.....	.64	.37	.....	.....

MONTHLY DISCHARGE of Bridge Creek at Raymond's Ranch, for 1912.

(Drainage area 6 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (1-30).....	10.1	1.09	3.49	0.582	0.65	208.
May.....	9.7	0.63	1.78	0.298	0.34	109.
June.....	6.8	0.20	0.85	0.142	0.18	51.
July.....	0.40	0.04	0.28	0.047	0.05	17.
August.....	0.50	0.05	0.28	0.047	0.05	17.
September.....	0.38	0.18	0.26	0.043	0.05	15.
October.....	0.50	0.22	0.36	0.060	0.07	22.
November (1-15).....	0.48	0.37	0.43	0.072	0.04	13.
The period.....	.....	.....	.....	.....	1.41	452.

BRIDGE CREEK NEAR SKULL CREEK POST OFFICE.

This station was established July 29, 1909, by H. R. Carscallen. It is located at the highway bridge on the surveyed trail running eastward from Maple Creek on the N.E.  $\frac{1}{4}$  Sec. 11, Tp. 11, Rge. 22, W. 3rd Mer. It is about four miles from Skull Creek post office, and 27 miles from Maple Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to the centre pile on the downstream side of the bridge. The zero of the gauge (elev. 87.51) is

referred to a permanent iron bench mark (assumed elev. 100.00), located on the right bank about 100 feet southeast of the gauge.

The channel is straight for 100 feet above and 30 feet below the station. Both banks are high and not liable to overflow. The stream is entirely devoid of tree growth. The bed of the creek is composed of clay and may shift somewhat at high stages. There is a small amount of vegetation at the station. The current is sluggish.

During high water, discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the inner face of the left, or west, abutment. Low-water measurements are made near the bridge by wading, and at very low stages a weir is used.

During 1912, the gauge was read by James Mann.

#### DISCHARGE MEASUREMENTS of Bridge Creek, near Skull Creek, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 20. . . . .	G. H. Whyte. . . . .	7.1	5.49	0.52	1.84	2.85
June 3. . . . .	J. S. Wright. . . . .	8.7	2.80	0.24	1.41	0.67
June 22. . . . .	do . . . . .				1.12	.05①
July 24. . . . .	do . . . . .					NIL
Aug. 17. . . . .	do . . . . .					NIL
Sept. 21. . . . .	do . . . . .					NIL
Oct. 24. . . . .	do . . . . .				1.28	0.26①
Nov. 21. . . . .	do . . . . .				1.30	0.22①

① Weir used.

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Bridge Creek, near Skull Creek, for 1912.

Day.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1. . . . .	..... ①		1.49	1.00	1.77	2.5	.86	.00
2. . . . .			1.50	1.04	1.59	1.48	.86	.00
3. . . . .			1.67	1.91	1.41	0.67	.86	.00
4. . . . .	3.99	17.3	1.75	2.3	1.23	.17	.87	.00
5. . . . .	2.94	10.2	1.81	2.7	1.20	.12	.89	.00
6. . . . .	2.68	8.4	1.88	3.1	1.25	.20	.97	.01
7. . . . .	2.80	9.8	1.84	2.8	1.22	.15	.97	.01
8. . . . .	3.11	11.4	1.78	2.5	1.19	.11	.97	.01
9. . . . .	3.17	11.8	1.67	1.91	1.18	.10	.99	.01
10. . . . .	2.91	10.0	1.35	1.28	1.17	.09	1.06	.02
11. . . . .	3.07	11.1	1.45	0.52	1.08	.03	1.18	.10
12. . . . .	2.67	8.3	1.43	.74	.91	.00	1.14	.06
13. . . . .	2.02	3.9	1.42	.71	.88	.00	1.07	.03
14. . . . .	2.03	4.0	1.36	.49	.89	.00	1.05	.02
15. . . . .	2.05	4.1	1.30	.31	2.61	2.9	1.04	.02
16. . . . .	2.08	4.2	1.26	.22	2.34	6.0	.99	.01
17. . . . .	2.07	4.2	1.21	.14	2.06	4.2	.95	.01
18. . . . .	2.08	4.2	1.18	.10	1.54	1.23	.94	.01
19. . . . .	2.03	4.0	1.18	.10	1.33	0.39	.93	.01
20. . . . .	1.84	2.9	1.18	.10	1.18	.10	.93	.01
21. . . . .	1.80	2.6	1.18	.10	1.10	.04	Dry	NIL
22. . . . .	1.76	2.4	1.18	.10	1.11	.05	"	"
23. . . . .	1.76	2.4	1.23	.17	1.04	.02	"	"
24. . . . .	1.77	2.5	1.27	.24	.96	.01	"	"
25. . . . .	1.88	3.1	1.32	.36	.91	.00	"	"
26. . . . .	1.81	2.7	1.61	1.58	.91	.00	"	"
27. . . . .	1.81	2.7	1.91	3.8	.86	.00	"	"
28. . . . .	1.64	1.75	3.68	15.2	.86	.00	"	"
29. . . . .	1.47	0.91	2.07	4.2	.86	.00	"	"
30. . . . .	1.48	.95	1.99	3.7	.86	.00	"	"
31. . . . .			1.92	3.3			"	②

① Ice conditions April 1 to 3. Not sufficient data to compute discharge.

② Creek dry to Aug. 16. No records after that date.

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MONTHLY DISCHARGE of Bridge Creek near Skull Creek, for 1912.

(Drainage area 15 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Persquare Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (4-30).....	17.3	0.91	5.62	0.375	0.38	301.
May.....	15.2	0.10	1.84	0.123	0.14	113.
June.....	6.0	0.00	0.685	0.046	0.05	41.
July.....	0.06	0.00	0.011	0.001	0.001	1.
The period.....					0.571	456

NOTE.—Creek dry to Aug. 16. No records after that date.

FEARON AND MOORHEAD BRIDGE CREEK DITCH NEAR SKULL CREEK.

This station was established July 6, 1911, by G. R. Elliott, on Messrs. Fearon and Moorhead's irrigation ditch, which diverts water from Bridge Creek on the S.E.  $\frac{1}{4}$  Sec. 33, Tp. 10, Rge. 22, W. 3rd Mer.

The gauge is located on S.E.  $\frac{1}{4}$  Sec. 33, and is about 25 feet from the intake. It is a plain staff, graduated in feet and inches, and is on the left bank of the ditch. The zero (elev. 94.49) is referred to a nail on the left side of the headgate marked "B.M." (assumed elev. 100.00).

The station is at a uniform cross section of the ditch, which is three feet wide at the bottom with side slopes of two to one.

During 1912, the gauge was read by H. Moorhead.

DISCHARGE MEASUREMENTS of Fearon & Moorhead Bridge Creek Ditch, near Skull Creek, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 20 .....	G. H. Whyte.....	3.5	0.64	0.69	1.0	0.44
June 3.....	J. S. Wright.....	3.0	0.64	0.55	0.9	0.35

## DAILY GAUGE-HEIGHT AND DISCHARGE of Fearon &amp; Moorhead Bridge Creek Ditch, near Skull Creek, for 1912.

DAY.	April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			0.96	0.41	0.96	0.41
2.....			0.96	0.41	0.92	0.37
3.....			0.96	0.41	0.90	0.35
4.....			0.96	0.41		
5.....			0.96	0.41		
6.....			1.00	0.45		
7.....			1.00	0.45		
8.....			1.00	0.45		
9.....			0.96	0.41		
10.....			0.92	0.37		
11.....			0.92	0.37		
12.....			0.92	0.37		
13.....			0.92	0.37		
14.....			0.92	0.37		
15.....			0.88	0.33		
16.....			0.88	0.33		
17.....			0.88	0.33		
18.....			0.83	0.29		
19.....			0.83	0.29		
20.....	1.00	0.45	0.83	0.29		
21.....	1.00	0.45	0.83	0.29		
22.....	1.00	0.45	0.92	0.37		
23.....	1.00	0.45	0.92	0.37		
24.....	1.00	0.45	0.83	0.29		
25.....	1.00	0.45	0.81	0.27		
26.....	0.92	0.37	0.83	0.29		
27.....	0.92	0.37	1.00	0.45		
28.....	0.92	0.37	0.92	0.37		
29.....	0.92	0.37	1.00	0.45		
30.....	0.96	0.41	1.00	0.45		
31.....			0.98	0.43		

Gates closed June 3.

## MONTHLY DISCHARGE of Fearon &amp; Moorhead Bridge Creek Ditch near Skull Creek for 1912.

(Drainage area — square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (20-30).....	0.45	0.37	0.417			9.0
May.....	0.45	0.27	0.340			21.0
June (1-3).....	0.41	0.35	0.380			2.0
The period.....						32.0

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DIMMOCK BROTHERS' DITCH

This station was established on July 29, 1912, by M. H. French. It is located on the S.E.  $\frac{1}{4}$  Sec. 16, Tp. 11, Rge. 21, W. 3rd Mer., and is 250 feet northwest of the intake of the ditch and 400 feet southeast of the flume.

The gauge, which is a plain staff graduated in feet and inches, is well driven into the ground. The zero of the gauge (elev. 96.53) is referred to the top of a wooden post (assumed elev. 400.00), driven into the ground on the south side of the ditch.

Discharge measurements are made with current meter or weir.

The ditch was not used during the season of 1912.

BRIDGE CREEK AT GULL LAKE.

This station was established March 29, 1911, by G. H. Whyte. It is located at the highway bridge on the S.E.  $\frac{1}{4}$  Sec. 23, Tp. 13, Rge. 19, W. 3rd Mer., near the Canadian Pacific Railway station.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the downstream side of the right abutment of the bridge. The zero of the gauge (elev. 95.63) is referred to a permanent iron bench mark (assumed elev. 100.00), located on the right bank 182 ft. from the gauge and 158 ft. from the northwest corner of the C.P.R. station.

The channel is slightly curved for 160 feet above but is straight for 80 feet below the station. Both banks are low and liable to overflow. The bed of the stream is sandy and liable to shift.

Discharge measurements are made from the bridge, or by wading near the section during high stages. During very low stages a weir is used. The initial point for sounding is at the north end of the downstream side of the bridge and is marked with a broad arrow.

The gauge was read by J. McArthur and J. Weismiller, during 1912.

DISCHARGE MEASUREMENTS of Bridge Creek at Gull Lake, in 1912.

Date.	Hydrographer.	Width.	Area. of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 17. ....	D. D. MacLeod .....	18 0	30.36	1.47	2.18	44.79
April 30. ....	do .....	15 0	6.90	0.604	0.83	4.07
June 19. ....	H. D. St. A. Smith. ....	14 0	6.80	0.361	0.93	2.46
July 3. ....	do .....					Nil.
July 16. ....	do .....					do ①
Aug. 6. ....	do .....					do ①
Sept. 4. ....	do .....					do ①
Oct. 2. ....	do .....					do ①
Oct. 15. ....	do .....					do ①
Nov. 15. ....	do .....					do ①

① Creek dry.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Bridge Creek, at Gull Lake, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1					0 90	3 8	0 32	0 17
2					0 88	3 6	0 37	0 28
3					0 69	1 82	0 21	Nil
4					0 60	1 22	Dry	*
5					0 60	1 22		
6					0 50	.79	0 21	*
7					0 42	.46	0 26	0 11
8					0 36	.24	0 26	0 11
9					0 35	.21	0 22	0 04
10					0 29	.14	0 18	Nil
11					0 26	.11	0 34	0 20
12			0 40 ①	0 38	0 24	.09	0 28	0 13
13			0 39	0 35	0 26	.11	0 22	0 04
14			0 38	0 32	0 30	.15	0 11	Nil
15			0 37	0 28	0 70	1 90	Dry.	*
16			0 36	0 24	0 70	1 90	*	*
17	2 18 ①	45	0 35	0 21	0 65	1 52	*	*
18	2 08	39	0 30	0 15	0 97	4 5	*	*
19	2 00	35	0 33	0 19	0 92	4 0	*	*
20	1 53	16	0 32	0 17	0 76	2 4	.26	0 11
21	1 11	6.7	0 30	0 15	0 58	1 13	.10	Nil
22	1 02	5 2	0 30	0 15	0 50	0 79	Dry.	*
23	1 02 ①	5 2	0 30	0 15	0 42	0 46	.18	*
24	1 01 ①	5 1	0 27	0 12	0 35	0 21	Dry ①	*
25	1 01 ②	5 1	0 25	0 12	0 30	0 15	*	*
26	1 00	4 9	0 26	0 12	0 27	0 12	*	*
27	1 00 ②	4 9	1 28	9 8	0 16	Nil	*	*
28	0 99	4 8	1 04	5 5	0 07	*	*	*
29	0 98	4 7	0 94	4 2	Dry.	*	*	*
30	0 95	4 3	0 91	3 9	*	*	*	*
31	④		0 90	3 8	*	*	*	*

① Observations commenced on April 17.

② Interpolated.

③ From May 1 to May 11 there was no observer.

④ Creek dry from July 23 to end of year.

## MONTHLY DISCHARGE of Bridge Creek at Gull Lake, for 1912.

(Drainage area 213 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (17-30)	4 5	4 3	13.3	0.0624	0.0325	45.0
May (12-31)	9 8	0 1	1 51	0.00708	0.0054	9.8
June	4 5	0 0	1 102	0.00517	0.0058	4 5
July	0 28	0 0	0 038	0.00018	0.0002	0 28
August						Nil.
September						Nil.
October						Nil.
November						Nil.
December						Nil.
The period					0.0439	59.58

NOTE.—Creek was dry from July 23 to the end of the year.

## SESSIONAL PAPER No. 25d

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Antelope Lake, Drainage Basin, Sask., in 1912.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. Feet.	Ft. per sec.	Sec. ft.
June 22.....	J. S. Wright.....	Dimmock Creek	Sec. 10-11-21-3. ①.....	.....	.....	.....	0 249
July 22.....	do.....	do	Sec. 10-11-21-3. ①.....	.....	.....	.....	0 072

NOTE.—Width is the actual width of water surface, not including piers. Area of section is the total area of the measured section, including both moving and still water.

① Weir measurement.

## LAKE OF THE NARROWS DRAINAGE BASIN.

*Description.*

Lake of the Narrows is a small lake, three miles long and one and a half miles wide, in Township 3, Range 23, West of the 3rd Meridian. It has a drainage area of about 200 square miles.

The principal stream in the basin is Skull Creek, which rises on the eastern slope of the Cypress Hills. It flows through a narrow valley for the greater part of its course, but as it nears the lake, the valley widens out into large meadows. The surrounding country is rolling prairie.

In very dry years, such as 1910, Skull Creek goes dry for a short time. The mean annual precipitation in the drainage basin is about 13 inches.

There are several small irrigation ditches in this drainage basin, the largest of which is Moorhead and Fearon's ditch, which diverts water from Skull Creek on the N.E.  $\frac{1}{4}$  Sec. 29, Tp. 10, Rge. 22, W. 3rd. Mer.

## SKULL CREEK AT DOYLE'S RANCH.

This station was established April 8, 1911, by G. H. Whyte, to obtain the discharge of the stream above all ditches. It is located on the N.E.  $\frac{1}{4}$  Sec. 29, Tp. 10, Rge. 22, W. 3rd Mer., about one quarter of a mile above the headgates of Fearon and Moorhead's irrigation ditch, one and a half miles above Skull Creek post office, and half a mile upstream from Thos. Doyle's house.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the left bank. The zero of the gauge (elev. 86.82) is referred to a permanent iron bench mark (assumed elev. 100.00), located 350 feet N. 32° E. of the gauge.

The channel is straight for about 20 feet above and below the station. The right bank is high, while the left is low and liable to overflow during high water stages. Both banks are well wooded. The bed is composed of sand and gravel which may shift during high water. The current is fairly swift.

Discharge measurements are made at low and ordinary stages by wading, or with a weir. At high stages, measurements are made from the traffic bridge at the lower station, which is three miles downstream.

During 1912, the gauge was read by Mr. Thomas Doyle.

## DISCHARGE MEASUREMENTS of Skull Creek at Doyle's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 22.....	G. H. Whyte.....	11.0	6 77	1 48	1.59	10 04
June 3.....	J. S. Wright.....	12.5	5.32	0.76	1 47	4 07
June 24.....	do.....	12.7	3 8	.53	1 37	2 02
July 25.....	do.....	12.6	3 88	.42	1 35	1 61
Aug. 21.....	do.....	5 2	2 62	.46	1 34	1 20
Sept. 10.....	do.....	5 8	3 06	.48	1 40	1 47
Oct. 26.....	do.....	6 0	3 21	.72	1 44	2 35
Nov. 21.....	do.....	5 8	3 01	.69	1 41	2 08



## DAILY GAUGE-HEIGHT AND DISCHARGE of Skull Creek at Doyle's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge-Height.	Dis-charge.	Gauge-Height.	Dis-charge.	Gauge-Height.	Dis-charge.	Gauge-Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1.55	7.9	1.50	5.4	1.35	1.25
2.....			1.80	24.	1.47	4.2	1.35	1.25
3.....			1.55	7.9	1.47	4.2	1.35	1.25
4.....			1.37	9.0	1.47	4.2	1.35	1.25
5.....			1.62	11.9	1.47	4.2	1.35	1.25
6.....			1.62	11.9	1.45	3.4	1.40	1.90
7.....			1.72	18.4	1.43	2.8	1.38	1.64
8.....			1.69	16.4	1.43	2.8	1.38	1.64
9.....			1.65	13.8	1.41	2.2	1.37	1.51
10.....			1.60	10.7	1.41	2.2	1.37	1.51
11.....			1.57	9.0	1.40	1.90	1.37	1.51
12.....			1.55	7.9	1.40	1.90	1.37	1.51
13.....			1.50	5.4	1.40	1.90	1.37	1.51
14.....			1.50	5.4	1.50	5.4	1.38	1.64
15.....			1.53	6.9	2.05	44.	1.35	1.25
16.....			1.50	5.4	1.78	23.	1.38	1.64
17.....			1.49	5.0	1.55	7.9	1.40	1.90
18.....			1.48	4.6	1.55	7.9	1.42	2.5
19.....			1.48	4.6	1.45	3.4	1.41	2.2
20.....			1.48	4.6	1.50	5.4	1.41	2.2
21.....			1.48	4.6	1.50	5.4	1.40	1.90
22.....			1.45	3.4	1.45	3.4	1.32	1.07
23.....			1.47	4.2	1.39	1.77	1.32	1.07
24.....			1.47	4.2	1.37	1.51	1.30	0.95
25.....			1.47	4.2	1.35	1.25	1.30	.95
26.....			1.47	4.2	1.35	1.25	1.30	.95
27.....			1.75	20.5	1.35	1.25	1.30	.95
28.....			2.10	48	1.35	1.25	1.29	.89
29.....			1.65	13.8	1.35	1.25	1.28	.85
30.....			1.58	9.6	1.35	1.25	1.27	.77
31.....			1.55	7.9	1.35	.....	1.25	.65

① Gauge re-established on this date. No records previous due to ice conditions and the gauge being destroyed.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Skull Creek at Doyle's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1 27	0 77	1 36	1 38	1 39	1 77	1 50	5 4
2	1 28	.83	1 36	1 38	1 40	1 90	1 49	5 0
3	1 35	1 25	1 36	1 38	1 41	2 2	1 48	4 6
4	1 35	1 25	1 37	1 51	1 41	2 2	1 48	4 6
5	1 37	1 51	1 37	1 51	1 41	2 2	1 47	4 2
6	1 36	1 38	1 35	1 25	1 42	2 5	1 47	4 2
7	1 36	1 38	1 35	1 25	1 43	2 8	1 47	4 2
8	1 35	1 25	1 34	1 19	1 43	2 8	1 47	4 2
9	1 34	1 19	1 34	1 19	1 47	4 2	1 46	3 8
10	1 34	1 19	1 33	1 13	1 45	3 4	1 46	3 8
11	1 34	1 19	1 33	1 13	1 47	4 2	1 46	3 8
12	1 35	1 25	1 34	1 19	1 48	4 6	1 47	4 2
13	1 35	1 25	1 35	1 25	1 45	3 4	1 47	4 2
14	1 37	1 51	1 35	1 25	1 42	2 5	1 48	4 6
15	1 37	1 51	1 35	1 25	1 40	1 90	1 50	5 4
16	1 50	5 4	1 35	1 25	1 45	3 4		
17	1 51	5 9	1 37	1 51	1 47	4 2		
18	1 47	4 2	1 38	1 64	1 45	3 4		
19	1 45	3 4	1 37	1 51	1 45	3 4		
20	1 35	1 25	1 40	1 90	1 42	2 5		
21	1 35	1 25	1 40	1 90	1 42	2 5		
22	1 35	1 25	1 43	2 8	1 42	2 5		
23	1 34	1 19	1 43	2 8	1 43	2 8		
24	1 34	1 19	1 42	2 5	1 43	2 8		
25	1 34	1 19	1 42	2 5	1 43	2 8		
26	1 34	1 19	1 42	2 5	1 44	3 1		
27	1 35	1 25	1 42	2 5	1 42	2 5		
28	1 35	1 25	1 42	2 5	1 43	2 8		
29	1 35	1 25	1 41	2 2	1 44	3 1		
30	1 35	1 25	1 41	2 2	1 47	4 2		
31	1 35	1 25			1 50	5 4		

## MONTHLY DISCHARGE of Skull Creek at Doyle's Ranch, for 1912.

(Drainage area 30 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (22-30)	10.7	5.4	9 21	0.307	0.10	164.
May	48.	3.4	10.17	0.339	0.39	625.
June	44.	1.25	5.26	0.175	0.20	313.
July	2.5	0.65	1.40	0.047	0.05	86.
August	5.9	1.19	1.69	0.056	0.06	104.
September	2.8	1.13	1.71	0.057	0.06	102.
October	5.4	1.77	3.03	0.101	0.12	186.
November (1-15)	5.4	3.8	4 41	.147	0.08	131.
The period					1.06	1,711.

## FEARON AND MOORHEAD SKULL CREEK DITCH.

This station was established July 6, 1911, by G. R. Elliott, on Messrs. Fearon and Moorhead's ditch, which diverts water from Skull Creek on the N. E.  $\frac{1}{4}$  Sec. 29, Tp. 10, Rge. 22, W. 3rd. Mer.

The gauge, which is a plain staff graduated in feet and inches, is on the right bank of the ditch. The zero (elev. 86.56) is referred to a permanent iron bench mark (assumed elev. 100.00), located 180 feet S. 25° E. of the gauge.

The station is at a uniform cross section of the ditch, which is five feet wide at the bottom with side slopes of one to one.

During 1912, the gauge was read by H. Moorhead.

## DISCHARGE MEASUREMENTS of Fearon and Moorhead Skull Creek Ditch at Skull Creek, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 20.....	G. H. Whyte.....	6.1	2 65	0 88	0'-5.44''	2.34
April 22.....	do.....	8 2	3 90	0 90	0'-8 82''	3.49
June 3.....	J. S. Wright.....	5.7	2 40	0.58	0'-6.44''	1.38

Note.—Gates closed, June 3.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Fearon and Moorhead Skull Creek Ditch, at Skull Creek, for 1912.

DAY.	April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	0'9"	3 7	0'7."	1 86		
2.....	0'9"	3 7	0'7."	1 86		
3.....	0'9"	3 7	0'6.5"	1 42		
4.....	0'8 5"	3 2				
5.....	0'9"	3 7				
6.....			8'5"	3 2		
7.....			0'10"	4 6		
8.....			0'9"	3 7		
9.....			0'9"	3 7		
10.....			0'9"	3 7		
11.....			0'9"	3 7		
12.....			0'8 5"	3 2		
13.....			0'8"	2 8		
13.....			0'8"	2 8		
15.....			0'7.5"	2 3		
16.....			0'7"	1 86		
17.....			0'7"	1 86		
18.....			0'7"	1 86		
19.....			0'6 5"	1 42		
20.....	0'5.5"	0.61	0'6.5"	1 42		
21.....	0'9"	3 7	0'6.5"	1 42		
22.....	0'9"	3 7	0'7"	1 86		
23.....	0'9"	3 7	0'6.75"	1 64		
24.....	0'9"	3 7	0'6.5"	1 42		
25.....	0'10.5"	5.1	0'6	1 00		
26.....	0'9.5"	4.1	0'6"	1 00		
27.....	0'9 5"	4.1	0'9"	3 7		
28.....	0'9"	3.7	0'10	4 6		
29.....	0'9"	3.7	0'9"	3 7		
30.....	0'10"	4.6	0'8 5"	3 2		
31.....			0'8"	2 8		

Gates closed June 3.

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MONTHLY DISCHARGE of Fearon and Moorhead Skull Creek Ditch at Skull Creek, for 1912.

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.		
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (20-30).....	5.1	0.61	3.70	.....	.....	81.
May.....	4.6	1.00	2.79	.....	.....	172.
June (1-3).....	1.86	1.42	1.71	.....	.....	10.
The period.....						263.

Gates closed June 3.

## FEARON AND MOORHEAD MAIN DITCH NEAR SKULL CREEK.

This station was established July 4, 1911, by G. R. Elliott, on Messrs. Fearon and Moorhead's main irrigation ditch, which diverts water from Skull and Bridge Creeks. The two branches join on the N.E.  $\frac{1}{4}$  Sec. 33, Tp. 10, Rge. 22, W. 3rd Mer.

The gauge is located on the flume of the N.E.  $\frac{1}{4}$  Sec. 33 and about 75 feet from the junction of the two branches of the ditch. It is a plain staff graduated to feet and inches, and is nailed at the centre of the right side of the flume. The zero (elev. 89.19) is referred to the top of a rock (assumed elev. 100.00), situated 140 feet northeast of the flume and on the right side of the ditch.

The flume is constructed of timber and has a bottom width of eight feet, with sides two feet in height.

During 1912, the gauge was read by H. Moorhead.

DISCHARGE MEASUREMENTS of Fearon and Moorhead Main Ditch near Skull Creek, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 20.....	G. H. Whyte.....	7.8	4.01	0.74	0'-4.88"	2.98
June 3.....	J. S. Wright.....	8.2	3.41	.35	0'-3.5"	1.20

Note.—Gates closed June 3.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Fearon &amp; Moorhead Main Ditch, near Skull Creek, for 1912.

DAY.	April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0'5 5"	4 2	0'4 0"	1 69
2			0'5 5"	4 2	0'4 0"	1 69
3			0'5 5"	4 2	0'3 5"	1 20
4			0'5"	3 2		
5			0'5"	3 2		
6			0'5 5"	4 2		
7			0'6"	5 3		
8			0'5 75"	4 8		
9			0'5 5"	4 2		
10			0'5"	3 2		
11			0'5"	3 2		
12			0'4 5"	2 4		
13			0'4 5"	2 4		
14			0'4 5"	2 4		
15			0'4"	1 69		
16			0'4"	1 69		
17			0'4"	1 69		
18			0'3 8"	1 20		
19			0'3 5"	1 20		
20			0'3 5"	1 20		
21			0'5 5"	4 2	0'3 25"	1 07
22			0'5 5"	4 2	0'4"	1 69
23			0'5 5"	4 2	0'4"	1 69
24			0'5 5"	4 2	0'3 5"	1 20
25			0'6"	5 3	0'3"	0 94
26			0'5 5"	4 2	0'3"	0 94
27			0'5 5"	4 2	0'6 5"	6 4
28			0'5 5"	4 2	0'6 5"	6 4
29			0'5 5"	4 2	0'6"	5 3
30			0'6"	5 3	0'5"	3 2
31					0'4"	1 69

Gates closed June 3.

## MONTHLY DISCHARGE of Fearon and Moorhead Main Ditch near Skull Creek, for 1912.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (21-30)	5 3	4 2	4 42			88.
May	6 4	0 94	2 91			179.
June (1-3)	1 69	1 20	1 53			9.
The period						276.

## SKULL CREEK NEAR SKULL CREEK.

This station was established June 29, 1908, by F. T. Fletcher. It is located on the N.W.  $\frac{1}{4}$  Sec. 10, Tp. 11, Rge. 22, W. 3rd Mer., at the highway bridge on the surveyed trail running east from Maple Creek. It is about two miles north of Skull Creek post office, and about twenty-five miles by trail east of Maple Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to the centre pile on the upstream, or south side of the bridge. The zero of the gauge (elev. 88.41) is referred to a permanent iron bench mark (assumed elev. 100.00), sunk in the left bank of the stream about forty feet southwest of the gauge.

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The channel is straight for 100 feet above and 150 feet below the station. Both banks are high and not liable to overflow. The banks are clear of brush for about fifty feet above and below the station, and then become densely wooded. The bed of the stream is composed of sand and may shift somewhat at high stages. The current is moderate.

Discharge measurements are made from the upstream side of the bridge. The initial point for soundings is the inner face of the right abutment of the bridge. There is only one channel at low stages, but owing to the centre row of piles supporting the bridge there are two channels at high stages of the stream. Low water measurements are made at or near the gauge by wading, and at very low stages a weir is used.

During 1912, the gauge was read by J. Mann.

## DISCHARGE MEASUREMENTS of Skull Creek, near Skull Creek, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 20	G. H. Whyte	14.9	20.22	0.91	1.88	18.49
June 3	J. S. Wright	9.5	5.72	.67	0.54	3.83
June 24	do	9.0	4.03	.57	.42	2.29
July 25	do	6.5	3.47	.39	.67	1.34
Aug. 19	do	6.5	3.97	.44	.75	1.74
Sept. 20	do	6.8	3.35	.29	.67	0.98
Oct. 25	do	7.7	3.84	.48	.72	1.83
Nov. 22	do	7.8	3.83	.53	.66	2.02

## DAILY GAUGE-HEIGHT AND DISCHARGE of Skull Creek near Skull Creek, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	4.82	72.0	0.80	6.0	0.84	6.4	0.44	1.85
2	5.04	76.0	0.81	6.2	.80	6.0	0.47	2.0
3	5.62	88.	0.84	6.4	.75	5.6	.51	2.2
4	5.43	84.0	1.05	8.6	.59	4.1	.56	2.5
5	4.82	72.	1.23	10.6	.62	4.3	.60	2.7
6	3.63	48.	1.40	12.6	.58	4.0	.84	4.8
7	4.73	70.	1.36	12.2	.61	4.2	.68	3.3
8	5.84	92.	1.20	10.3	.57	3.9	.63	2.8
9	6.48	104.	1.04	8.5	.54	3.6	.62	2.6
10	4.92	74.	0.90	7.1	.51	3.3	.61	2.4
11	5.91	94.	.81	6.2	.49	3.2	.65	2.6
12	4.01	56.	.75	5.6	.47	3.0	.62	2.3
13	2.63	30.	.70	5.1	.44	2.8	.62	2.2
14	2.55	28.	.63	4.4	.46	2.9	.61	2.0
15	2.50	27.	.61	4.2	1.61	15.2	.61	1.90
16	2.42	26.	.60	4.2	1.25	10.9	.61	1.80
17	2.42	26.	.59	4.1	0.86	6.6	.61	1.70
18	2.39	26.	.57	3.9	.64	4.5	.60	1.50
19	2.36	25.	.56	3.8	.63	4.4	.59	1.40
20	1.88	18.6	.52	3.4	.57	3.9	.58	1.20
21	1.64	15.5	.51	3.3	.57	3.9	.58	1.10
22	1.40	12.6	.51	3.3	.41	2.5	.58	1.00
23	1.24	10.8	.55	3.7	.41	2.5	.59	1.00
24	1.12	9.4	.58	4.0	.42	2.6	.58	0.80
25	1.03	8.4	.61	4.2	.42	2.2	.57	.70
26	0.94	7.5	.67	4.8	.42	2.1	.56	1.09
27	.91	7.2	.73	5.4	.41	1.90	.52	0.97
28	.90	6.6	3.52	46.	.39	1.70	.47	.83
29	.81	6.2	1.54	14.3	.39	1.65	.42	.69
30	.80	6.0	0.92	7.3	.41	1.65	.34	.47
31			.97	7.8			.34	.47

## DAILY GAUGE-HEIGHT AND DISCHARGE of Skull Creek near Skull Creek, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.32	0.42	0.68	1.47	0.75	1.73	0.73	1.65
2.....	.36	.53	.68	1.47	.74	1.69	.73	1.65
3.....	.39	.60	.68	1.47	.74	1.69	.73	1.65
4.....	.54	1.03	.68	1.47	.74	1.69	.72	1.62
5.....	.69	1.51	.68	1.47	.75	1.73	.72	1.62
6.....	.54	1.03	.69	1.51	.72	1.62	.73	1.65
7.....	.48	0.85	.71	1.58	.73	1.65	.73	1.65
8.....	.39	.60	.71	1.58	.73	1.65	.73	1.65
9.....	.33	.45	.72	1.62	.74	1.69	.73	1.65
10.....	.28	.32	.71	1.58	.75	1.73	.73	1.65
11.....	.34	.47	.72	1.62	.75	1.73	.72	1.62
12.....	.40	.63	.73	1.65	.75	1.73	.72	1.62
13.....	.72	1.62	.74	1.69	.75	1.73	.71	1.58
14.....	.67	1.44	.73	1.65	.75	1.73	.70	1.54
15.....	.63	1.30	.73	1.65	.75	1.73	.70	1.54
16.....	.68	1.47	.73	1.65	.75	1.73	.....	.....
17.....	.72	1.62	.73	1.65	.75	1.73	.....	.....
18.....	.72	1.62	.72	1.62	.75	1.73	.....	.....
19.....	.72	1.62	.72	1.62	.74	1.69	.....	.....
20.....	.69	1.51	.74	1.69	.74	1.69	.....	.....
21.....	.65	1.37	.73	1.65	.73	1.65	.....	.....
22.....	.61	1.24	.72	1.62	.73	1.65	.....	.....
23.....	.58	1.15	.71	1.58	.74	1.69	.....	.....
24.....	.57	1.12	.69	1.51	.73	1.65	.....	.....
25.....	.55	1.06	.69	1.51	.73	1.65	.....	.....
26.....	.54	1.03	.70	1.54	.73	1.65	.....	.....
27.....	.53	1.00	.71	1.58	.73	1.65	.....	.....
28.....	.55	1.06	.72	1.62	.74	1.69	.....	.....
29.....	.61	1.24	.72	1.62	.74	1.69	.....	.....
30.....	.68	1.47	.74	1.69	.74	1.69	.....	.....
31.....	.68	1.47	.....	.....	.74	1.69	.....	.....

## MONTHLY DISCHARGE of Skull Creek near Skull Creek, for 1912.

(Drainage area 33 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	104.	6.0	40.89	1.24	1.38	2,432.
May.....	46.	3.3	7.66	0.232	0.27	471.
June.....	15.2	1.65	4.18	0.127	0.14	249.
July.....	4.8	0.47	1.77	0.054	0.06	109.
August.....	1.62	0.32	1.09	0.033	0.04	67.
September.....	1.69	1.47	1.55	0.047	0.05	92.
October.....	1.73	1.62	1.69	0.051	0.06	104.
November (1-15).....	1.65	1.54	1.62	0.049	0.03	48.
The period.....					2.03	3,572.

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Lake of the Narrows drainage basin, in 1912.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. feet.	Feet per sec.	Sec.-ft.
April 19.....	G. H. Whyte	Coulee (Dry Fork).	30-10-22-3	4.3	1.21	0.595	0.72

## CRANE LAKE DRAINAGE BASIN.

*Description.*

Crane Lake is one of the largest of the lakes which receive their supply from the drainage of the northern slope of the Cypress Hills. It is situated in Tp. 13, Rge. 23, W. 3rd Mer., and covers an area of 25 square miles.

The lake, which has no outlet, is shallow and the water is saline in character. It is fed by Piapot Creek, which rises in the Cypress Hills and flows northeastward and is joined by Bear Creek in Sec. 7, Tp. 12, Rge. 22, W. 3rd Mer., before it reaches the lake.

The country to the north of the Lake is rolling and of little use, being the eastern end of a range of sand hills which extend northwestward some 40 miles. South of the lake the country is rolling prairie which is devoid of tree growth, except along the creeks where there is small growth of willow and shrub. Closer to the hills the country becomes more broken and the tree growth increases, making the ravines and coulees at the head of the creeks natural reservoirs which regulate the spring run-off considerably.

There are a number of irrigation schemes in operation and proposed in this basin, also one or two industrial schemes along the main line of the Canadian Pacific Railway.

The mean annual precipitation of the northern part of the basin is about 12 inches, but in the hills this is exceeded. During the winter season, from November to April, the streams are frozen over.

The damage done in this drainage basin by the spring floods of 1912 amounted to about \$1,500.

## EAST BRANCH OF BEAR CREEK AT JOHNSON'S RANCH.

This station was established August 18, 1909, by H. R. Carscallen. It is located on the S. E.  $\frac{1}{4}$  Sec. 21, Tp. 10, Rge. 23, W. 3rd Mer., about a mile and a half southeast of Skibereen Post Office.

The gauge, which is a plain staff graduated to feet and hundredths, is attached to a vertical post sunk in the bed of the stream at the right bank and securely stayed. The zero (elev. 92.26) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the right bank in the line of the gauging section and 53 feet from the gauge.

The channel is straight for 50 feet above and 40 feet below the station. Both banks are high and not liable to overflow, except during extreme floods. The banks are free from brush at the station, but are wooded above and below. The bed of the stream is composed of coarse gravel and stones. Large stones in the bed of the stream make accurate soundings at the station rather difficult to obtain. The current is moderate.

Discharge measurements are made at or near the gauge by wading, or by means of a weir. A measuring wire is stretched across the stream at the section. The initial point for soundings is a square stake, driven close to the ground on the left bank and marked "I.P."

During 1912, the gauge was read by Ralph Johnson, until October 27. After that date no observations were made.

## DISCHARGE MEASUREMENTS of East Branch of Bear Creek at Johnson's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
April 19.....	G. H. Whyte.....	12.0	9 70	1 622	1.16	15.74
June 1.....	J. S. Wright.....	10.5	5.27	1.14	0.94	6.02
June 20.....	do.....	10.5	6.56	0.95	0.88	6.24
July 20.....	do.....	9.5	3.66	0.43	0.65	1.58
Aug. 16.....	do.....	10.0	4.68	0.54	0.73	2.52
Sept. 18.....	do.....	10.2	4.05	0.25	0.65	1.01
Oct. 22.....	do.....	10.0	4.98	0.50	0.74	2.48
Nov. 19.....	do.....	10.0	4.62	0.45	0.73	2.07



## DAILY GAUGE-HEIGHT AND DISCHARGE OF East Branch of Bear Creek at Johnson's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.			0.96	7 7	0.94	7 1	0 77	3.0
2.			1.04	10.5	.89	5.7	.78 <sup>①</sup>	3.2
3.			1.06	11.3	.84	4.4	.79 <sup>①</sup>	3.4
4.			1.07	11.7	.85	4.6	.79 <sup>①</sup>	3.4
5.			1.23	19.2	.83	4 2	.80 <sup>①</sup>	3.6
6.			1.40	29.	.84	4 4	.80	3.6
7.			1.80	52.	.84	4 4	.77 <sup>①</sup>	3.0
8.			1.25	20.	.80	3.6	.75 <sup>①</sup>	2.6
9.			1.14	14.7	.80	3.6	.73	2.3
10.			1.80	52.	.79	3 4	.72	2.2
11.			1.00	9 0	.70	1.90	.80	3.6
12.			.97	8.0	.64	1.25	.79	3.4
13.			0.95	7 4	.84	4 4	.78	3.2
14.			.95	7 4	1 11	12 4	.77	3.0
15.			.95	7 4	1.49	34	.76	2.8
16.			.91	6.2	1.27	21.0	.76	2.8
17.			.91	6.2	1.04	10 4	.73 <sup>①</sup>	2.3
18.			.91	6.2	1.02	9.8	.70 <sup>①</sup>	1.90
19.	1.15	15.2	.91	6.2	0.90	6.0	.67 <sup>①</sup>	1.57
20.	1.11	13.3	.92	6.5	.86	4 9	.65	1.35
21.	1.03	10 1	.93	6.8	.81	3.8	.62	1.05
22.	0.95	7 4	.91	6.2	.80	3.6	.60	0.85
23.	.97	8.0	.90	6.0	.80 <sup>①</sup>	3.6	.62	1.05
24.	1.40	29.	.90	6.0	.79 <sup>①</sup>	3.4	.64	1.25
25.	1.50	35.	.90	6.0	.79 <sup>①</sup>	3.4	.62	1.05
26.	1.40	29.	1.13	14 2	.79 <sup>①</sup>	3 4	.60	0.85
27.	1.40	29.	1.35	26.	.78 <sup>①</sup>	3.2	.55	.45
28.	1.40	29.	1.24	20.	.78 <sup>①</sup>	3.2	.54	.39
29.	1.40	29.	1.20	17.6	.78 <sup>①</sup>	3.2	.53	.33
30.	1.20	17 6	1.16	15.7	.78 <sup>①</sup>	3.2	.53	.33
31.			1.10	12.9			.55	.45

① No observation. Gauge heights interpolated.

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DAILY GAUGE-HEIGHT AND DISCHARGE of East Branch of Bear Creek, at Johnson's Ranch, for 1912.

DAY.	August.		September.		October.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0.56	0.53	0.66	1.46	0.67	1.57
2	0.56	0.53	0.65	1.35	0.67	1.57
3	0.57	0.61	0.63	1.15	0.69	1.79
4	0.61	0.95	0.65	1.35	0.69	1.79
5	0.65	1.35	0.65	1.35	0.69	1.79
6	0.63	1.15	0.66	1.46	0.68	1.68
7	0.63	1.15	0.64	1.25	0.67	1.57
8	0.65	1.35	0.64	1.25	0.68	1.68
9	0.63	1.15	0.64	1.25	0.68	1.68
10	0.63	1.15	0.64	1.25	0.75	2.6
11	0.64	1.25	0.65	1.35	0.79	3.4
12	0.65	1.35	0.65	1.35	0.79	3.4
13	0.65	1.35	0.63	1.15	0.79	3.4
14	0.65	1.35	0.65	1.35	0.79	3.4
15	0.66	1.46	0.65	1.35	0.79	3.4
16	0.73	2.3	0.65	1.35	0.79	3.4
17	0.68	1.68	0.64	1.25	0.78	3.2
18	0.67	1.57	0.64	1.25	0.77	3.0
19	0.66	1.46	0.65	1.35	0.76	2.8
20	0.66	1.46	0.65	1.35	0.75	2.6
21	0.64	1.25	0.65	1.35	0.73	2.3
22	0.62	1.05	0.66	1.46	0.74	2.4
23	0.60	0.85	0.67	1.57	0.75	2.6
24	0.59	0.77	0.67	1.57	0.75	2.6
25	0.61	0.95	0.66	1.46	0.75	2.6
26	0.63	1.15	0.67	1.57	0.74	2.4
27	0.64	1.25	0.67	1.57		
28	0.61	0.95	0.67	1.57		
29	0.65	1.35	0.68	1.68		
30	0.67	1.57	0.69	1.79		
31	0.67	1.57				

① No observation. Gauge height interpolated.

② No observation after October 26.

## MONTHLY DISCHARGE of East Branch of Bear Creek at Johnson's Ranch, for 1912.

(Drainage area 22 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (19-30)	35.	7.4	20.97	0.950	0.42	498.
May	52.	6.0	14.1	0.640	0.74	867.
June	34.	1.25	6.18	0.280	0.31	368.
July	3.6	0.33	2.07	0.090	0.10	127.
August	2.3	0.53	1.22	0.060	0.07	75.
September	1.79	1.15	1.39	0.060	0.07	83.
October (1-26)	3.4	1.57	2.49	0.110	0.10	128.
The period					1.81	2,146.

## WEST BRANCH OF BEAR CREEK AT BERTRAM'S RANCH.

This station was established September 16, 1909, by H. R. Carscallen. It is located on the S. W.  $\frac{1}{4}$  Sec. 32, Tp. 10, Rge. 23, W. 3rd Mer., about a mile and a half north of Skibereen post office. It is about three hundred yards above the junction of this branch with the east branch of Bear Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post sunk in the bed of the stream at the left bank and firmly stayed to the bank. It is referred to bench marks as follows: (1) A spike-head in the top of the initial point stake on

the left bank, marked "B.M."; elevation 8.00 above the zero of the gauge; (2) a spike-head in the top of a pointed poplar stump blazed and marked "B.M."; just below the bank on the left side of the stream, and about 50 feet downstream from the gauge; elevation 8.41 feet above the zero of the gauge.

The channel is straight for 25 feet above and 15 feet below the station. Both banks are comparatively high and will overflow only in extreme flood. The banks are free from brush at the station, but are heavily wooded immediately above and twenty feet below. The bed of the creek is composed of sand and coarse gravel. The current is moderate at the station, and becomes very swift twenty feet downstream.

During ordinary stages discharge measurements are made at, or a short distance below, the gauge by wading. High-water measurements are made at the government bridge, situated about three-quarters of a mile upstream. The initial point for soundings at the station is a square stake driven close to the ground on the left bank and marked "I.P."

During 1912, the gauge was read by Charles Bertram.

#### DISCHARGE MEASUREMENTS of West Branch of Bear Creek at Bertram's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
April 18.	G. H. Whyte.	25.5	15.48	2.03	1.81	31.47
June 1.	J. S. Wright.	26.	10.36	1.29	1.60	13.36
June 20.	do	23.3	10.81	1.31	1.59	14.20
July 20.	do	19.6	5.57	0.81	1.42	4.52
Aug. 15.	do	20.6	7.17	.34	1.35	2.47
Sept. 18.	do	21.2	7.17	.63	1.50	4.54
Oct. 22	do	12.0	7.62	.66	1.57	5.07
Nov. 19.	do	11.8	6.90	.70	1.55	4.81

#### DAILY GAUGE-HEIGHT AND DISCHARGE of West Branch of Bear Creek at Bertram's Ranch, for 1912

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.			1.75	26.	1.76	27.	1.40	4.0
2.			1.70	21.	1.75	26.	1.40	4.0
3.			1.80	30.	1.69	21.	1.45	5.6
4.			1.80	30.	1.60	13.8	1.45	5.6
5.			1.85	35.	1.60	13.8	1.50	7.8
6.	4.10	255.	1.95	45.	1.60	13.8	1.50	7.8
7.	4.10	255.	2.00	49.	1.60	13.8	1.50	7.8
8.	3.20	167.	2.10	59.	1.60	13.8	1.50	7.8
9.	3.20	167.	1.95	45.	1.60	13.8	1.50	7.8
10.	3.20	167.	1.80	30.	1.60	13.8	1.50	7.8
11.	2.60	108.	1.80	30.	1.60	13.8	1.48	6.9
12.	2.10	59.	1.80	30.	1.60	13.8	1.48	6.9
13.	2.00	49.	1.80	30.	1.55	10.6	1.48	6.9
14.	1.80	30 0	1.75	26.	1.90	40. ①	1.50	7.8
15.	1.85	35.	1.70	21.	2.40	89.	1.50	7.8
16.	1.85	35.	1.70	21.	1.90	40.	1.50	7.8
17.	1.90	40.	1.70	21.	1.85	35.	1.50	7.8
18.	1.80	30.	1.70	21.	1.75	26.	1.50	7.8
19.	1.80	30	1.70	21.	1.69	21.	1.48	6.9
20.	1.80	30	1.65	17.4	1.59	13.2	1.48	6.9
21.	1.80	30	1.65	17.4	1.50	7.8	1.46	6.0
22.	1.80	30	1.65	17.4	1.45	5.6	1.46	6.0
23.	1.80	30	1.80	30.	1.45	5.6	1.44	5.3
24.	1.79	30	1.80	30.	1.45	5.6	1.45	5.6
25.	1.79	30.	1.75	26.	1.45	5.6	1.45	5.6
26.	1.78	28.	1.75	26.	1.40	4.0	1.45	5.6
27.	1.77	27.	1.75	26.	1.40	4.0	1.45	5.6
28.	1.77	27.	1.75	26.	1.40	4.0	1.40	4.0
29.	1.75	26.	2.20	69.	1.40	4.0	1.35	2.6
30.	1.75	26.	2.05	54.	1.40	4.0	1.30	1.50
31.			1.85	35.			1.30	1.50

①Heavy rain caused increased discharge.

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of West Branch of Bear Creek at Bertram's Ranch, for 1912

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.30	1.50	1.40	2.9	1.45	2.6	1.55	4.6
2.....	1.30	1.50	1.38	2.4	1.43	2.1	1.55	4.6
3.....	1.30	1.50	1.38	2.3	1.43	2.0	1.55	4.5
4.....	1.45	5.6	1.45	4.1	1.45	2.5	1.55	4.5
5.....	1.45	5.6	1.45	4.0	1.45	2.4	1.55	4.5
6.....	1.45	5.6	1.45	4.0	1.49	3.4	1.60	6.8
7.....	1.40	4.0	1.45	3.9	1.49	3.3	1.60	6.8
8.....	1.40	4.0	1.46	4.2	1.51	4.0	1.60	6.8
9.....	1.40	4.0	1.46	4.0	1.65	10.0	1.60	6.7
10.....	1.35	2.6	1.46	4.0	1.75	16.6	1.60	6.7
11.....	1.30	1.50	1.46	3.9	1.65	9.6	1.60	6.7
12.....	1.40	4.0	1.46	3.9	1.60	7.0	1.60	6.7
13.....	1.45	5.6	1.46	3.8	1.55	5.0	1.58	6.0
14.....	1.50	7.8	1.46	3.8	1.65	9.5	1.55	4.5
15.....	1.55	10.6	1.46	3.6	1.65	9.4	1.55	4.5
16.....	1.45	5.6	1.46	3.6	1.65	9.4	.....	.....
17.....	1.43	4.1	1.46	3.5	1.65	9.3	.....	.....
18.....	1.40	3.7	1.46	3.5	1.65	9.2	.....	.....
19.....	1.47	6.4	1.45	3.1	1.65	9.1	.....	.....
20.....	1.45	5.0	1.45	3.1	1.60	6.6	.....	.....
21.....	1.45	5.0	1.45	3.0	1.60	6.4	.....	.....
22.....	1.40	3.5	1.50	4.5	1.55	4.7	.....	.....
23.....	1.38	3.0	1.50	4.4	1.55	4.7	.....	.....
24.....	1.38	2.9	1.55	6.1	1.55	4.7	.....	.....
25.....	1.35	2.2	1.55	6.0	1.55	4.7	.....	.....
26.....	1.38	2.8	1.53	5.2	1.55	4.7	.....	.....
27.....	1.40	3.2	1.53	5.1	1.55	4.7	.....	.....
28.....	1.40	3.1	1.53	5.1	1.55	4.6	.....	.....
29.....	1.45	4.5	1.53	4.9	1.55	4.6	.....	.....
30.....	1.45	4.4	1.53	4.9	1.55	4.6	.....	.....
31.....	1.40	3.0	.....	.....	1.55	4.6	.....	.....

## MONTHLY DISCHARGE of West Branch of Bear Creek at Bertram's Ranch, for 1912.

(Drainage area 45 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (6-30).....	255.	26.	69 64	1.55	1.44	3,453.
May.....	89.	17 4	31 13	0.692	0.80	1,914.
June.....	89.	4.0	24 53	0.545	0.61	1,460.
July.....	7.8	1.50	6.09	0.135	0.16	374.
August.....	10.6	1.50	4 12	0.091	0.10	253.
September.....	6.1	2.3	4 03	0.088	0.10	240.
October.....	16.6	2.0	6.00	0.133	0.15	369.
November (1-15).....	6.8	4 5	5.66	0.126	0.07	168.
The period.....	.....	.....	.....	.....	3.43	8,231.

## BEAR CREEK NEAR UNSWORTH'S RANCH.

This station was established June 22, 1908, by F. T. Fletcher. It is located on the S. E.  $\frac{1}{4}$  Sec. 18, Tp. 11, Rge. 23, W. 3rd Mer., at the highway bridge on the surveyed trail running east from Maple Creek. It is about one half mile south of S. Unsworth's ranch, and fifteen miles east of Maple Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to the centre pile of the downstream side of the bridge. It is referred to bench marks as follows: (1) A circle of nail-heads in the top of the stringer at the left abutment on the downstream side

of the bridge, elevation, 14.05 feet above the zero of the gauge: (2) the top of the iron pin in the road mound southeast of the bridge on the left bank elevation, 18.97 feet above the zero of the gauge.

The channel is straight for 100 feet above and below the station. Both banks are high and not liable to overflow. The station is kept clear of underbrush, but both banks are covered with small trees above and below the bridge. The bed of the stream is sandy and is liable to change at high stages of the creek. The current is moderate, becoming sluggish at very low stages.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the inner face of the left abutment of the bridge. Low water measurements are made at a wading section about one half mile downstream from the gauge, or about 200 feet above. There is only one channel at low stages, but at high stages the centre row of piles supporting the bridge divides the stream into two channels. Gauge height records are sometimes affected by beaver dams.

During 1912, the gauge was read by S. Unsworth.

#### DISCHARGE MEASUREMENTS of Bear Creek, near Unsworth's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
April 18.....	G. H. Whyte	13.0	44.0	1.39	3.73	61.0
June 1.....	J. S. Wright.	10.0	28.1	0.92	2.28	23.08
June 19.....	do	10.5	18.93	.93	1.90	17.57
July.....	do	9.8	11.01	.46	0.87	5.11
Aug. 15.....	do	7.8	9.86	.27	.55	2.64
Sept. 17.....	do	10.9	17.9	.19	1.58	3.38
Oct. 22.....	do	11.0	20.7	.40	1.79	8.29
Nov. 19.....	do	10.4	18.9	.42	1.72	7.92

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Bear Creek, near Unsworth's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	8.03	205.	2.10	20.0	2.25	23.	0.85	5.0
2.....	11.08	306.	2.16	21.	2.13	20.0	1.03	6.6
3.....	9.98	269.	2.20	22.	2.03	18.9	1.05	6.8
4.....	11.53	321.	2.23	22.	1.88	16.7	1.02	6.5
5.....	11.28	313.	2.58	29.	1.80	15.5	1.00	6.4
6.....	10.70	293.	3.13	42.	1.80	15.5	1.03	6.6
7.....	9.90	267.	3.21	45.	1.73	14.6	1.10	7.3
8.....	9.78	263.	5.03	106.	1.70	14.1	1.10	7.3
9.....	11.08	308.	4.18	76.	1.61	13.0	1.10	7.3
10.....	12.53	354.	3.03	40.	1.53	12.0	1.13	7.6
11.....	13.18	376.	2.81	34.	1.48	11.4	1.13	7.6
12.....	13.23	378.	2.70	31.	1.38	10.2	1.08	7.1
13.....	11.93	334.	2.58	29.	1.35	9.9	1.05	6.8
14.....	9.13	241.	2.53	28.	1.88	16.7	1.00	6.4
15.....	7.08	173.	2.41	26.	3.38	30.	0.95	5.9
16.....	5.23	112.	2.23	22.	6.48	153.	.95	5.9
17.....	4.28	80.	2.13	20.0	5.08	107.	.95	5.9
18.....	4.18	76.	2.01	18.6	2.43	26.	.93	5.7
19.....	3.88	66.	1.98	18.1	1.78	15.2	.90	5.5
20.....	3.78	63.	1.91	17.1	1.55	12.2	.87	5.2
21.....	3.03	40.	1.80	15.5	1.52	11.8	.80	4.6
22.....	2.91	36.	1.73	14.6	1.50	11.6	.80	4.6
23.....	2.83	34.	1.76	15.0	1.43	10.8	.78	4.4
24.....	2.63	30.	1.73	14.6	1.35	9.9	.75	4.2
25.....	2.63	30.	1.70	14.1	1.25	8.8	.75	4.2
26.....	2.60	29.	1.68	13.9	1.17	8.0	.73	4.0
27.....	2.53	28.	1.83	15.9	1.03	6.6	.70	3.8
28.....	2.48	27.	4.48	86.	0.90	5.5	.65	3.4
29.....	2.41	26.	6.08	140.	.73	4.0	.60	3.0
30.....	2.23	22.	5.28	113.	.80	4.6	.55	2.6
31.....			4.78	97.			.50	2.3

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Bear Creek, near Unsworth's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0.40	1.60	1.30	4.8	1.65	5.1	1.82	9.0
2	.40	1.60	1.30	4.6	1.65	5.1	1.84	9.2
3	.43	1.78	1.32	4.5	1.68	5.4	1.84	9.2
4	.45	1.93	1.32	4.2	1.68	5.8	1.86	9.4
5	.55	2.6	1.35	4.3	1.68	5.8	1.86	9.4
6	.60	3.0	1.35	4.0	1.70	6.0	1.84	9.2
7	.60	3.0	1.38	4.0	1.70	6.0	1.84	9.2
8	.58	2.9	1.40	4.0	1.70	6.3	1.82	9.0
9	.55	2.6	1.42	3.9	1.75	6.8	1.79	8.6
10	.50	2.3	1.42	3.7	1.85	7.8	1.77	8.4
11	.48	2.1	1.45	3.8	1.95	8.8	1.77	8.4
12	.53	2.5	1.45	3.5	1.98	9.7	1.74	8.1
13	.55	2.6	1.48	3.5	2.00	9.9	1.72	8.0
14	.55	2.6	1.48	3.3	2.00	9.9	1.69	7.6
15	.58	2.8	1.50	3.2	1.98	9.7	1.69	7.6
16	.70	3.5	1.50	3.0	1.98	10.0		
17	1.00	5.8	1.55	3.2	1.95	9.6		
18	1.10	6.8	1.57	3.3	1.95	9.6		
19	1.20	7.4	1.57	3.3	1.92	9.4		
20	1.25	7.7	1.60	3.5	1.90	9.5		
21	1.28	7.7	1.65	4.0	1.90	9.5		
22	1.30	7.6	1.70	5.7	1.84	8.8		
23	1.30	7.3	1.73	6.0	1.77	8.4		
24	1.32	7.2	1.73	6.0	1.74	8.1		
25	1.32	6.9	1.70	5.7	1.72	8.0		
26	1.30	6.4	1.68	5.0	1.69	7.6		
27	1.30	6.1	1.63	4.7	1.72	8.0		
28	1.33	6.1	1.65	4.7	1.74	8.1		
29	1.35	6.0	1.65	4.7	1.74	8.1		
30	1.33	5.6	1.65	5.1	1.79	8.6		
31	1.32	5.3			1.79	8.6		

① From August 17 to November 15, the gauge heights were affected by beaver dams being built a short distance below. The records for this period are therefore only approximate.

## MONTHLY DISCHARGE of Bear Creek, near Unsworth's Ranch, for 1912.

(Drainage area 100 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April	378.	22.	170.	1.70	1.90	10,116.
May	140.	13.9	38.9	0.389	0.45	2,392.
June	153.	4.	21.9	0.219	0.24	1,303.
July	7.6	2.3	5.50	0.055	0.06	338.
August	7.7	1.60	4.49	0.045	0.05	276
September	6.0	3.0	4.24	0.042	0.05	252
October	10.0	5.1	8.0	0.080	0.09	492
November (1-15)	9.4	7.6	8.69	0.087	0.05	258
The period					2.89	15,427.

① Records are only approximate.

## NEEDHAM BROTHERS' DITCH NEAR PIAPOT.

This station was established on June 22, 1911, by G. R. Elliott, on the irrigation ditch of Messrs. Needham Brothers which diverts water from Bear Creek on the S. W.  $\frac{1}{4}$  Sec. 30, Tp. 11, Rge. 23, W. 3rd Mer. It is located on the S. W.  $\frac{1}{4}$  Sec. 30, at the outlet of the sluice box.

The gauge is a plain staff graduated to feet and inches. The zero of the gauge (elev. 97.47) is referred to the top of a plug (assumed elev. 100.00) on the right bank of ditch.

The station is on a uniform cross-section of the ditch which has a bottom width of seven feet with side slopes of one to one.

The dam in Bear Creek was washed out during the spring floods and the ditch was not used during 1912.

#### BRANIFF DITCH NEAR PIAPOT.

This station was established June 22, 1911, by G. R. Elliott, on D. Braniff's irrigation ditch, which diverts water from Bear Creek on the S. E.  $\frac{1}{4}$  Sec. 30, Tp. 11, Rge. 23, W. 3rd Mer. It is located on the S. E.  $\frac{1}{4}$  Sec. 30, and about 20 feet from the point of intake.

The gauge, which is a plain staff graduated to feet and inches, is fixed to the upstream side of a log bridge across the ditch.

A small amount of water was used in 1912, but no records were obtained.

#### BEVERIDGE EAST DITCH ON PIAPOT CREEK.

This station was established June 9, 1911, by G. R. Elliott, on the irrigation ditch of D. Beveridge, which diverts water from Piapot Creek on the N. E.  $\frac{1}{4}$  Sec. 7, Tp. 10, Rge. 24, W. 3rd Mer., to irrigate land on the east side of the creek. It is located on N. E.  $\frac{1}{4}$  Sec. 7, and is about one half mile from the intake.

The gauge, which is a plain staff graduated to feet and inches, is located at the upstream side of the bridge over the ditch.

The station is at a uniform cross section of the ditch, which is three feet wide at the bottom with side slopes of one to one.

This ditch was running for a short time in 1912, but as no discharge measurements were obtained the daily discharges have not been computed.

#### DAILY GAUGE-HEIGHT of Beveridge East Ditch on Piapot Creek, for 1912.

DAY.	May.	
	Gauge	
	Height.	
	Feet.	
1....		
2....		
3....		
4....		
5....	①0.67	
6....	0.58	
7....	0.67	
8....	0.67	
9....		
10....	0.67	
11....	0.67	
12....		
13....	0.58	
14....	0.58	
15....	0.58	
16....		
17....	0.58	
18....	0.58	
19....		
20....	0.58	
21....	0.58	
22....	0.67	
23....	0.67	
24....	0.58	
25....	0.58	
26....		
27....	②0.67	
28....		
29....		
30....		
31....		

① Headgate of ditch opened.

② Headgate of ditch closed.

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## BEVERIDGE WEST DITCH ON PIAPOT CREEK.

This station was established June 5, 1911, by F. T. Fletcher, on the irrigation ditch of D. Beveridge, which diverts water from Piapot Creek on the N. W.  $\frac{1}{4}$  Sec. 18, Tp. 10, Rge. 24, W. 3rd Mer., to irrigate land on the west side of the creek. It is located on the N. W.  $\frac{1}{4}$  Sec. 18, and is about 240 feet from the intake.

The gauge, which is a plain staff graduated to feet and inches, is located at left side of the ditch. The zero of the gauge (elev. 98.16) is referred to a peg in a cairn of stones (assumed elev. 100.00), located upstream from the gauge, and on the left bank.

The station is at a uniform cross section of the ditch, which is two feet wide on the bottom with side slope of one to one.

This ditch was running during the most of May, but as no discharge measurements were obtained it is impossible to compute the daily discharges. The gauge heights alone are given. Mr. D. Beveridge supplied gauge height records for the period in which the ditch was in use.

## DAILY GAUGE-HEIGHT of Beveridge West Ditch on Piapot Creek, for 1912.

DAY.	May.	
	Gauge Height.	
	Feet.	
1.....		
2.....		
3.....		
4.....	① 0 42	
5.....		
6.....	0 33	
7.....	0 50	
8.....	0 42	
9.....		
10.....	0 42	
11.....	0 33	
12.....		
13.....	0 33	
14.....	0 33	
15.....	0 33	
16.....		
17.....	0 29	
18.....	0 29	
19.....		
20.....	0 25	
21.....	0 25	
22.....	0 33	
23.....	0 33	
24.....	0 29	
25.....	0 29	
26.....		
27.....	② 0 42	
28.....		
29.....		
30.....		
31.....		

① Gates opened.

② Gates closed.

## MOORHEAD DITCH ON PIAPOT CREEK.

This station was established June 10, 1911, by G. R. Elliott, on the irrigation ditch of Mr. H. Moorhead, which diverts water from Piapot Creek on the S. E.  $\frac{1}{4}$  Sec. 25, Tp. 10, Rge. 22, W. 3rd Mer.

The gauge is located on the N. W.  $\frac{1}{4}$  Sec. 25, about three-quarters of a mile from the point of intake. The gauge, which was a plain staff graduated in feet and inches, is at the right side of the ditch. The zero (elev. 98.23) is referred to a wooden stake (assumed elev. 100.00), situated on the left bank.

This station is at a regular cross section of the ditch which is three and a half feet wide at the bottom with side slopes of one to one.

This ditch was running for a short time during 1912, but as no records were obtained the daily discharge could not be computed.



## DISCHARGE MEASUREMENTS of Moorhead Ditch on Piapot Creek, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 18. . . . .	J. S. Wright. . . . .	4 4	3 66	0 91	1 29	3 34

## PIAPOT CREEK AT CUMBERLAND'S RANCH.

This station was established June 17, 1908, by F. T. Fletcher. It was originally located on Sec. 17, Tp. 11, Rge. 24, W. 3rd Mer., at the highway bridge on the surveyed trail running east of Maple Creek and about nine miles from Maple Creek. On account of the difficulty of obtaining an observer, it was moved on May 13, 1909, by H. R. Carscallen, to a wading section near A. Cumberland's house. It is now located in the N. E.  $\frac{1}{4}$  Sec. 18, Tp. 11, Rge. 24, W. 3rd Mer., about one mile north of the bridge.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a post sunk in the bed of the stream at the left bank and securely stayed to the bank. The zero (elev. 88.75) is referred to a permanent iron bench mark (assumed elev. 100.00), located on the right bank 47 feet N. 40° E from the gauge, and sunk within five inches of the ground.

The channel is straight for 50 feet above and 100 feet below the station. The right bank is high and not liable to overflow; the left is comparatively low and will overflow at flood stages of the stream. The bed of the stream is composed of sand and may shift during high stages. The current is sluggish. During the summer months vegetation in the stream bed gives considerable trouble.

During ordinary stages, discharge measurements are made from the downstream side of the bridge at the old station.

During 1912, the gauge was read by A. Cumberland.

## DISCHARGE MEASUREMENTS of Piapot Creek at Cumberland's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 17. . .	G. H. Whyte . . . . .	11 10	12 36	1 48	1 93	18 28
May 31 . . .	J. S. Wright. . . . .	13 3	18 85	1 20	2 25	22 65
June 19 . . .	do . . . . .	11.	12 63	0 79	1 93	9 96
July 19 . . .	do . . . . .	10 5	11 98	0 23	1 61	2 72
Aug. 15. . .	do . . . . .	10 7	11 53	20	1 54	2 36
Sept. 16. . .	do . . . . .	10 6	11 49	25	1 49	2 81
Oct. 22 . . .	do . . . . .	11.	11 78	36	1 56	4 22
Nov. 18 . . .	do . . . . .	11.	11 15	33	1 44	3 66

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DAILY GAUGE-HEIGHT AND DISCHARGE of Piapot Creek at Cumberland's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	①		1.68	7 8	2.01	12 5	1.57	2 7
2.....			1.58	5 3	1.91	9 3	1.67	4 1
3.....			1.95	15 8	1.72	5 0	1.58	2 8
4.....	3.73	108.	1.83	11 3	1.70	4 6	1.52	2 2
5.....	3.48	84.	1.91	14 10	1.70	4 6	1.57	2 7
6.....	2 58	51.	1 91	13 6	1 61	3 2	1.95	10 4
7.....	2.35	39.	2.42	37.	1.58	2 8	1.72	5 0
8.....	2.93	68.	2.62	47.	1.51	2 1	1.57	2 7
9.....	2.88	66.	2.19	26.	1.49	1 91	1.47	1 73
10.....	3.38	91.	1.98	15 4	1.54	2 4	1.71	4 8
11.....	3 98	121.	1.83	10 2	1.45	1 55	1.74	5 3
12.....	2 91	67.	1 69	6 4	1 44	1 47	1.70	4 6
13.....	2 38	41.	1.68	6 2	1 37	0 91	1.71	4 8
14.....	2 05	25.	1.58	4 2	1 70	4 6	1.71	4 8
15.....	1.98	21.	1.57	4 0	3.72	96.	1.92	9 6
16.....	1 88	16 2	1 48	2 7	3.35	78.	1.74	5 3
17.....	1 93①	18 3	1.48	2 7	2.42	31.	1.70	4 6
18.....	1 88	16 0	1.43	2 1	2.05	14 0	1 67	4 1
19.....	1.88	16 0	1 37	1 60	1.93	9 9	1 61	3 2
20.....	1.83	13 6	1.48	2 5	1.71	4 8	1 60	3 0
21.....	1 87	15 0	1.46	2 2	1.52	2 2	1 64	3 6
22.....	1 77	11 2	1.76	6 8	1 47	1 73	1 61	3 2
23.....	1 83	13 2	1.88	9 9	1.42	1 31	1 63	3 5
24.....	1 77	11 0	1 48	2 2	1 37	0 91	1 61	3 2
25.....	1.75	10 4	1 33	1 00	1 36	.83	1 63	3 5
26.....	1.68	8 1	1.28	0 60	1 33	.61	1 61	3 2
27.....	1 83	12 5	1.72	5 5	1 32	.54	1 61	3 2
28.....	1 73	9 2	4 63	109.	1 37	.91	1 60	3 0
29.....	1 67	7 6	2 97	59.	1 42	1 31	1 56	2 6
30.....	1.68	7 8	2 60	40.	1 39	1 07	1 55	2 5
31.....			2 25	23 0 ①			1 51	2 1

①Shifting conditions, April 17 to May 31.

②Ice conditions April 1 to 3. Not sufficient data to compute discharge.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Piapot Creek at Cumberland's Ranch, for 1912.

DRY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1.56	2.6	1.50	2.0	1.46	1.64	1.63	3.5
2	1.56	2.6	1.54	2.4	1.46	1.64	1.64	3.6
3	1.61	3.2	1.55	2.5	1.46	1.64	1.58	2.8
4	1.60	3.0	1.64	3.6	1.46	1.64	1.49	1.91
5	1.91	9.3	1.65	3.8	1.48	1.82	1.50	2.0
6	1.63	3.5	1.60	3.0	1.46	1.64	1.51	2.1
7	1.63	3.5	1.55	2.5	1.45	1.55	1.54	2.4
8	1.61	3.2	1.51	2.1	1.46	1.64	1.59	2.9
9	1.56	2.6	1.50	2.0	1.67	4.1	1.54	2.4
10	1.51	2.1	1.49	1.91	1.70	4.6	1.49	1.91
11	1.46	1.64	1.49	1.91	1.71	4.8	1.50	2.0
12	1.59	2.9	1.50	2.0	1.70	4.6	1.49	1.91
13	1.61	3.2	1.49	1.91	1.61	3.2	1.48	1.82
14	1.59	2.9	1.55	2.5	1.60	3.0	1.46	1.64
15	1.54	2.4	1.49	1.91	1.56	2.6	1.48	1.82
16	1.99	11.8	1.49	1.81	1.51	2.1		
17	1.95	10.4	1.50	2.0	1.53	2.3		
18	1.93	9.9	1.51	2.1	1.57	2.7		
19	1.60	3.0	1.50	2.0	1.61	3.2		
20	1.55	2.5	1.57	2.7	1.61	3.2		
21	1.54	2.4	1.51	2.1	1.66	4.0		
22	1.51	2.1	1.51	2.1	1.56	2.6		
23	1.55	2.5	1.54	2.4	1.54	2.4		
24	1.60	3.0	1.51	2.1	1.53	2.3		
25	1.59	2.9	1.50	2.0	1.53	2.3		
26	1.55	2.5	1.51	2.1	1.52	2.2		
27	1.55	2.5	1.54	2.4	1.53	2.3		
28	1.55	2.5	1.46	1.64	1.53	2.3		
29	1.59	2.9	1.46	1.64	1.53	2.3		
30	1.60	3.0	1.46	1.64	1.54	2.4		
31	1.59	2.9			1.58	2.8		

## MONTHLY DISCHARGE of Piapot Creek at Cumberland's Ranch, for 1912.

(Drainage area 50 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (4-30)	121.	7.6	35.8	0.716	0.72	1,917.
May	109	0.60	16.0	0.320	0.37	984.
June	96.	0.54	10.07	0.201	0.22	599.
July	10.4	1.73	3.94	0.079	0.09	242.
August	11.8	1.64	3.72	0.074	0.09	229.
September	3.8	1.64	2.22	0.044	0.05	132.
October	4.8	1.55	2.63	0.053	0.06	162.
November (1-15)	3.6	1.64	2.32	0.046	0.03	69.
The period					1.63	4,334.

## SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Crane Lake drainage basin, in 1912.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. Feet.	Ft. per Sec.	Sec.-Ft.
April 18.....	G. H. Whyte ....	Coulee .....	S.E. 3-11-23-3...	4.2	2.4	1.25	3.04
April 19.....	do .....	do .....	S.E. 21-10-23-3...	3.5	1.15	0.556	0.63
April 19.....	do .....	do .....	26-10-23-3.....	5.0	2.4	0.60	1.44

## HAY LAKE DRAINAGE BASIN.

*General Description.*

Hay Lake is in Tp. 11, Rge. 25, W. 3rd Mer., and is fed by Hay Creek which rises in the Cypress Hills. It is a comparatively small body of saline water of an approximate area of three square miles. Like all lakes in this locality it has no outlet.

The basin supplies water for a number of irrigation schemes, and also to the town of Maple Creek for domestic and industrial purposes, the water being piped some nine miles, by means of a gravity system.

The annual precipitation averages about twelve inches. In 1912, the rains occurred in May, June, August and October; the heaviest being in May and June. A heavy fall of snow during the winter caused a comparatively large run-off in the spring of 1912.

## HAY CREEK AT HAY CREEK SCHOOL.

This station was established on July 4, 1910, by R. G. Swan. It is located on the S.W.  $\frac{1}{4}$  Sec. 29, Tp. 10, Rge. 25, W. 3rd Mer., and is above Mr. Fauquier's ditch and below the overflow of the Maple Creek waterworks reservoir.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the right bank of the stream. The zero of the gauge (elev. 94.79) is referred to a permanent iron bench mark (assumed elev. 100.00) sunk in the right bank about 125 feet east of the gauge.

The channel of the creek is slightly curved for about eight feet above and 50 feet below the gauge. The bed of the stream is sandy and covered with vegetation, which affects the point of control. The current is sluggish, and during high stages both banks, being low, are liable to overflow.

Discharge measurements are made with a meter at high stages and with a weir at ordinary and low stages. During 1912, the overflow from the Maple Creek waterworks reservoir flowed into the creek a short distance above the station and served to raise the discharge at this station.

During 1912, the gauge was read by Miss F. Burnham.

## DISCHARGE MEASUREMENTS of Hay Creek at Hay Creek School, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 16.....	G. H. Whyte ..	8.5	7.62	0.73	1.58	5.55
May 25.....	J. S. Wright.....	9	4.94	.13	1.42	0.63
June 17.....	do .....	7.7	6.18	.50	1.49	3.09
July 16.....	do .....	8.	1.46	.13	1.17	0.19
Aug. 13.....	do .....				1.24	.36①
Sept. 12.....	do .....				1.16	.08①
Oct. 18.....	do .....				1.24	.18①
Nov. 16.....	do .....				1.22	.19①

① Weir measurement.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Hay Creek at Hay Creek School, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		③	1.34	0 75	1.62①	6 8		③
2			1.45①	2 2	1.55①	4 7		
3			1.56	5.00	1.47	2 6		
4			1.56①	5 0	1 43	1 88		
5			1.57①	5.3	1.40	1.40		
6			1.57	5.3	1.38	1.17		
7			1.76	11.2	1.37	1.05		
8			2.06	20.5	1.36①	0 93		
9			1.73	10.2	1.35①	.82		
10			1.58	5.6	1.35	0.82		
11			1.58①	5 6	1.34	.71		
12			1.57①	5.3	1.33	.67		
13			1.56	5 0	1.32	.59		
14			1.55	4 7	1.38①	1.17		
15			1.52	3.9	1.45①	2 2		
16	1.58	5.6	1.47	2 6	1.51①	3 6		
17	1.57	5.3	1.54	4 4	1.58	5 6		
18	1.57	5.3	1.51	3 6	1.46	2 4		
19	1.56	5 0	1 47①	2 6	1.39	1.29		
20	1.53①	4 1	1 44	2 0	1 36	0.93		
21	1.51①	3 6	1.39	1.29	1.25	.24		
22	1 48	2 9	1.39①	1.29	1.26①	.28		
23	1.45	2 2	1 40①	1 40	1.27①	.32		
24	1.45	2 2	1.41①	1 56	1 28			
25	1.44	2 0	1.42	1 70	1.30	.45		
26	1.39	1.29	1 46①	2 4	1 28	.36		
27	1.38①	1.17	1 50	3 3	1 26	.28		
28	1.37①	1 05	2.80	43	1 25	.24		
29	1.36	0.93	2.02	19 2	1.25①	.24		
30	1.35	.82	1.97	17.7	1.24①	0.22		
31			1.70	9 3				

① Gauge height interpolated.

② No observer during month of July.

③ No observer until April 16.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Hay Creek at Hay Creek School, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1.24 ①	0.22	1.19 ①	0.15	1.22	0.19	1.23	0.21
2	1.24 ①	.22	1.18 ①	.13	1.21	.17	1.23 ①	.21
3	1.25 ①	.24	1.18	0.13	1.20	.16	1.24 ①	.22
4	1.26 ①	.28	1.20	.16	1.23	.21	1.24	.22
5	1.27	0.32	1.22	.19	1.23 ①	.21	1.25	.24
6	1.27	.32	1.21	.17	1.23 ①	.21	1.24	.22
7	1.26	.28	1.20 ①	.16	1.23	.21	1.24	.22
8	1.25	.24	1.19 ①	.15	1.23 ①	.21	1.24	.22
9	1.24	.22	1.18	.13	1.24	.22	1.24 ①	.22
10	1.25 ①	.24	1.17	.12	1.24	.22	1.23 ①	.21
11	1.27 ①	.32	1.16	.10	1.26	.28	1.23	.21
12	1.28	.37	1.16	.10	1.25 ①	.24	1.24	.22
13	1.27	.32	1.20	.16	1.24 ①	.22	1.24	.22
14	1.25	.24	1.21 ①	.17	1.24	.22	1.25	.24
15	1.24	.22	1.22 ①	.19	1.23	.21	1.24	0.22
16	1.26	.28	1.23	.21	1.23	.21		
17	1.26 ①	.28	1.19	.15	1.24	.22		
18	1.25 ①	.24	1.17	.12	1.24	.22		
19	1.25	.24	1.18 ①	.13	1.24 ①	.22		
20	1.24	.22	1.19	.15	1.25 ①	.24		
21	1.22	.19	1.19 ①	.15	1.26	.28		
22	1.20	.16	1.20 ①	.16	1.23	.21		
23	1.19	.15	1.21	.17	1.24	.22		
24	1.18 ①	.13	1.22	.19	1.23	.21		
25	1.17 ①	.12	1.22	.19	1.22	.19		
26	1.16	.10	1.21	.17	1.22 ①	.19		
27	1.19	.15	1.22	.19	1.23 ①	.21		
28	1.20	.16	1.22 ①	.19	1.23 ①	.21		
29	1.21	.17	1.21 ①	.17	1.23	.21		
30	1.24	.22	1.21	0.17	1.23	.21		
31	1.20	0.16			1.23	0.21		

① Gauge heights interpolated.

## MONTHLY DISCHARGE of Hay Creek at Hay Creek School, for 1912.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (16-30)	5.6	0.82	2.90	0.097	0.05	86.
May	43.	.75	6.87	0.229	0.26	422.
June	6.8	0.22	1.48	0.049	0.05	88.
July						14. ②
August	0.37	0.10	0.227	0.008	0.009	14.
September	0.21	0.10	0.157	.005	0.006	9.
October	0.28	0.16	0.214	0.007	0.008	13.
November (1-15)	0.24	0.21	0.220	0.007	0.004	13.
The period					0.387	659.

② No observer during month of July. Discharge estimated.

## HAY CREEK AT FAUQUIER'S RANCH.

This station was established on April 22, 1909, by F. T. Fletcher. It is located on the N.E.  $\frac{1}{4}$  Sec. 30, Tp. 10, Rge. 25, W. 3rd Mer., about seven miles southeast of Maple Creek. It is situated below the intake of H. Fauquier's irrigation ditch, and also below the intake of the Maple Creek waterworks. Hence, records of flow obtained at this station do not represent the total discharge of the stream. The flow of springs below the Maple Creek waterworks intake, together with drainage, and the overflow from the Maple Creek waterworks, give a continuous flow in the creek above the station. This flow which is very largely the overflow from the Maple Creek waterworks, varies greatly, depending upon the consumption of water by the town of Maple Creek and by the Canadian Pacific Railway. The disappearance of water before reaching this station is explained, in part, by the fact that Mr. Fauquier diverts water into his irrigation ditch. The remainder of the water must seep through the gravel of the creek bed before it reaches this station. The fact that springs break out a short distance below the gauge and give a continuous flow (so far as is known) seems to bear out the seepage theory.

The gauge, which is a plain staff graduated to feet and hundredths, is fixed to a post at the left bank. The zero of the gauge (elev. 91.39) is referred to a permanent iron bench mark (assumed elevation 100.00), sunk in the left bank about 30 feet southwest of the gauge.

The channel is straight for 100 feet above and 200 feet below the station. Both banks are high and not liable to overflow. The bed of the stream is composed of sand and coarse gravel and is liable to shift at high stages. The current is sluggish during low water but is very swift at high stages.

Discharge measurements are made near the gauge by wading and at very low stages a weir is used. The initial point for soundings is a square stake driven close to the ground on the left bank, marked "I.P."

During 1912, the gauge was read by Mr. H. H. Fauquier.

No water was diverted by Mr. Fauquier's ditch during the season of 1912.

## DISCHARGE MEASUREMENTS of Hay Creek at Fauquier's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 16.....	G. H. Whyte.....	7.5	7.52	0.79	1.01	5.91
May 25.....	J. S. Wright.....	6.3	3.87	.07	0.63	0.28
June 17.....	do.....	7.5	6.22	.45	.85	2.80
July 16.....	do.....					Nil. ①
Aug. 13.....	do.....				0.57	0.049 ②
Sept. 13.....	do.....				Dry.	Nil.
Oct. 18.....	do.....				0.63	0.144 ②
Nov. 16.....	do.....				.71	.28 ②

① Water standing in pools.

② Weir measurement.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Hay Creek at Fauquier's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.08	31.	0.71	0.81	0.90	3.7	Dry.	Nil
2.....	2.21	34.	.86	3.0	.84	2.6	"	"
3.....	2.28	36.	.96	4.9	.77	1.57	"	"
4.....	2.21	34.	.93	4.3	.73	1.04	"	"
5.....	1.82	25.	.95	4.6	.77	1.57	"	"
6.....	1.36	14.0	.98	5.3	.75	1.28	"	"
7.....	1.47	16.7	1.57	19.1	.70	0.70	0.75	1.28
8.....	1.57	19.1	1.53	18.8	.67	.47	.70	0.70
9.....	1.84	26.	1.19	10.0	.65	.32	.67	.47
10.....	1.04	21.	0.97	5.1	.61	.14	.63	.22
11.....	1.65	21.	.91	3.9	Dry.	Nil	.61	.14
12.....	1.55	18.6	.86	3.0	"	"	.60	.10
13.....	0.98	5.3	.82	2.3	1.60	19.8	.63	.22
14.....	1.07	7.2	.77	1.57	1.95	28.	.56	.04
15.....	1.06	7.0	.77	1.57	1.45	16.2	.47①	.00
16.....	1.01	5.9	.73	1.04	0.95	4.6	.46①	.00
17.....	1.02	6.1	.71	0.81	.77	1.57	Dry.	Nil
18.....	0.97	5.1	.70	.70	.71	0.81	"	"
19.....	.97	5.1	.70	.70	.68	.55	"	"
20.....	.91	3.9	.71	.81	.67	.47	"	"
21.....	.86	3.0	.57	.05	.65	.32	"	"
22.....	.82	2.3	.81	2.2	Dry.	Nil	"	"
23.....	.82	2.3	.82	2.3	"	"	"	"
24.....	.82	2.3	.71	0.81	"	"	"	"
25.....	.80	2.0	.56	.04	"	"	"	"
26.....	.78	1.71	.57	.05	"	"	"	"
27.....	.84	2.6	.99	5.5	"	"	"	"
28.....	.72	0.93	2.39	38.	"	"	"	"
29.....	.75	1.28	1.22	10.7	"	"	"	"
30.....	.70	0.70	1.22	10.7	"	"	"	"
31.....			1.07	7.2			"	"

① Water standing in pools.



## DAILY GAUGE-HEIGHT AND DISCHARGE of Hay Creek at Fauquier's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	Dry.	Nil	Dry.	Nil	Dry	Nil	0.72	0.93
2.	"	"	"	"	"	"	.72	.93
3.	"	"	"	"	"	"	.70	.70
4.	0.63	0.22	"	"	"	"	.69	.62
5.	.65	.32	"	"	"	"	.71	.81
6.	Dry.	Nil	"	"	"	"	.71	.81
7.	"	"	"	"	"	"	.70	.70
8.	"	"	"	"	"	"	.71	.81
9.	"	"	"	"	"	"	.70	.70
10.	"	"	"	"	0.56	0.04	.70	.70
11.	"	"	"	"	.68	.55	.66	.40
12.	0.55	0.02	"	"	.68	.55	.62	.19
13.	.57	.05	"	"	.61	.14	.61	.14
14.	.57	.05	"	"	.57	.05	.60	.10
15.	.57	.05	"	"	.49 ①	.00	.58	.07
16.	.78	1.71	"	"	.47 ①	.00		
17.	.59	.08	"	"	.49 ①	.00		
18.	.53	.01	"	"	.63	.21		
19.	.57	.05	"	"	.70	.70		
20.	.59	.08	"	"	.67	.47		
21.	.61	.14	"	"	.66	.40		
22.	.58	.07	"	"	.50	.01		
23.	Dry.	Nil	"	"	.50	.01		
24.	"	"	"	"	.52	.01		
25.	"	"	"	"	.56	.04		
26.	"	"	"	"	.65	.32		
27.	"	"	"	"	.70	.70		
28.	"	"	"	"	.72	0.93		
29.	"	"	"	"	③			
30.	"	"	"	"	③			
31.	"	"	"	"	③			

① Water standing in pools.

② Creek frozen.

## MONTHLY DISCHARGE of Hay Creek at Fauquier's Ranch, for 1912.

(Drainage area 32 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.	36.	0.70	12.04	0.376	0.42	716.
May.	38.	0.04	5.48	0.171	0.20	337.
June.	28.	0.00	2.86	0.089	0.10	170.
July.	1.28	0.00	0.102	0.003	0.004	6.
August.	1.71	0.00	0.092	0.003	0.004	6.
September.						Nil.
October (1-28).	0.93	0.00	0.183	0.006	0.006	10.
November (1-15).	0.93	0.07	0.574	0.018	0.01	17.
The period.					0.744	1,262.

## SESSIONAL PAPER No. 25d

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Hay Lake Drainage Basin, Sask., in 1912.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Fect.</i>	<i>Sq. feet.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
June 17.....	J. S. Wright...	Maple Creek Reservoir (overflow).	S.W. 29-10-25-3.	.....	.....	.....	① 0 21
July 16.....	do .....	do .....	do .....	.....	.....	.....	Nil.
Aug. 12.....	do .....	do .....	do .....	.....	.....	.....	① 0 046
Sept. 12.....	do .....	do .....	do .....	.....	.....	.....	Nil.
Oct. 19.....	do .....	do .....	do .....	.....	.....	.....	Nil.
Nov. 16.....	do .....	do .....	do .....	.....	.....	.....	Nil.
July 17.....	do .....	Maple Creek water main.....	do .....	.....	.....	.....	③ 0 387
Aug. 12.....	do .....	do .....	do .....	.....	.....	.....	③ 0 387
Sept. 12.....	do .....	do .....	do .....	.....	.....	.....	③ 0 387
Oct. 19.....	do .....	do .....	do .....	.....	.....	.....	③ 0 387
Nov. 16.....	do .....	do .....	do .....	.....	.....	.....	③ 0 387
Sept. 12.....	do .....	North Br. Saunders Springs.....	N.W. 20-10-25-3.	.....	.....	.....	① 0 057
Oct. 19.....	do .....	do .....	do .....	.....	.....	.....	① 108
Nov. 16.....	do .....	do .....	do .....	.....	.....	.....	① .055

NOTE.—Width is the actual width of water surface, not including piers. Area of section is the total area of the measured section, including both moving and still water.

① Weir measurement.

③ Measurement made with Simplex Meter.

## BIG STICK LAKE DRAINAGE BASIN.

*General Description.*

Big Stick is one of the largest lakes in the northern Cypress Hills district. It is situated about Tp. 15, Rge. 25, W. 3rd Mer., and covers an area of 35 square miles. The lake is alkaline in character and has no outlet.

The only source of supply of the lake is Maple Creek which, with its tributary Gap Creek, rises in the Cypress Hills thirty miles south. On the south and east the lake is bounded by the Sand Hills. The drainage area is 820 square miles.

The topography of the drainage basin is for the most part gently rolling and the creek slope is small except near the source. The basin is bare of trees except in the hills. The channel is flat, wide and, in most places, sandy.

The spring break-up in 1912 took place about March 28. This was the only flood of importance during the year. No damage of any extent was caused by floods.

The precipitation during 1913 was about 13 inches, 9 inches of which took place in May June and August.

There are several small irrigation ditches in the basin.

## MAPLE CREEK AT MAPLE CREEK.

This station was established May 9, 1908, by R. J. Burley. It is located at the highway bridge just north of the Canadian Pacific Railway tracks in the town of Maple Creek, on the road allowance east of the N.E.  $\frac{1}{4}$  Sec. 16, Tp. 11, Rge. 16, W. 3rd Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is attached vertically to a pile on the upstream side of the bridge. The zero of the gauge (elev. 92.83) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the right bank at the west road fence, 37  $\frac{1}{2}$  feet west and 13 feet south of the southeast corner of the bridge.

The channel is straight for 200 feet above and 100 feet below the station. Both banks are comparatively low and will overflow at high-water stages of the stream. The bed of the stream is composed of sand and may shift during flood stages. The current is moderate at high and sluggish at low stages of the stream.

During high water discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the face of the right, or south abutment, and is marked by "O" in white paint on the bridge beam. During ordinary stages, discharge measurements are made about fifty feet downstream from the gauge by wading, and at low stages a weir is used. The bridge is not at right angles to the current and measurements from the bridge must be corrected.

During 1912, the gauge was read by Miss Kate Williams.

## DISCHARGE MEASUREMENTS of Maple Creek at Maple Creek, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 26 . . . . .	M. H. French . . . . .	24.5	11.22	0.63	2.96	7.08
April 13. . . . .	G. H. Whyte . . . . .	38.0	51.82	0.93	3.135	48.13
May 8. . . . .	G. R. Elliott . . . . .	42.2	106.19	1.33	3.82	141.43
May 8. . . . .	do . . . . .	33.0	43.92	0.98	2.42	42.95
June 8. . . . .	do . . . . .	17.0	9.15	0.35	1.23	3.21
July 16. . . . .	do . . . . .					Nil. <sup>①</sup>
Aug. 15. . . . .	do . . . . .					Nil. <sup>②</sup>
Aug. 16. . . . .	do . . . . .	34.0	20.64	0.30	1.605	6.20
Sept. 16. . . . .	do . . . . .				0.55	Nil. <sup>①</sup>
Oct. 22. . . . .	do . . . . .				0.57	Nil. <sup>①</sup>
Nov. 16. . . . .	do . . . . .				0.56	Nil. <sup>②</sup>

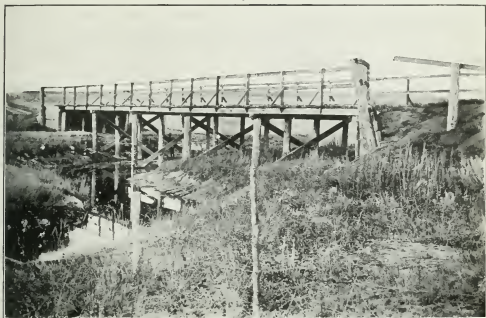
① Too small to measure.

② Small trickle.

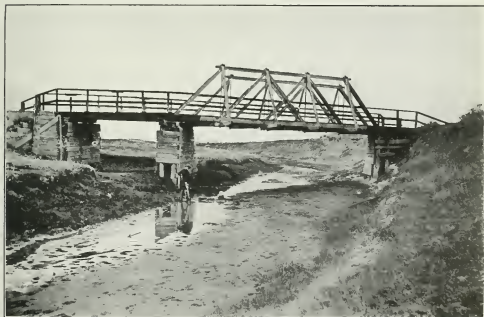
## DAILY GAUGE-HEIGHT AND DISCHARGE of Maple Creek at Maple Creek, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1. . . . .	4.00	160.	1.44	5.6	1.80 ①	12.8	0.74	0.04
2. . . . .	5.18	308.	1.44 ①	5.6	1.64	8.4	0.78	0.08
3. . . . .	5.39	338.	1.44	5.6	1.52	6.7	0.78	0.08
4. . . . .	6.11	446	1.50 ①	6.4	1.44	5.6	0.78	0.08
5. . . . .	5.60	369.	1.58	7.5	1.3	4.4	0.78	0.08
6. . . . .	3.62	139	1.63	8.2	1.32	4.0	0.78	0.08
7. . . . .	4.40	205	1.72	10.0	1.30	3.8	0.90	0.35
8. . . . .	4.60	230	3.52	114.	1.26	3.3	0.90	0.35
9. . . . .	4.80	256	2.72	61	1.17	2.2	0.93	0.47
10. . . . .	4.30 ①	193	2.20	33.0	1.18 ①	2.3	1.11	1.60
11. . . . .	4.00 ①	160	1.87	16.0	1.18	2.3	0.89	0.32
12. . . . .	3.87	147	1.67	8.9	1.04	1.04	0.83	0.16
13. . . . .	3.12	85	1.52	6.7	1.00	0.80	0.73	0.04
14. . . . .	2.64	57	1.44	5.6	1.10 ①	1.50	0.73	0.04
15. . . . .	1.93	18.8	1.50	6.4	2.00 ①	22.	0.75	0.05
16. . . . .	1.93	18.8	1.41	5.2	3.41	105	0.73	0.04
17. . . . .	2.01	23	1.35	4.4	2.24	35	0.73	0.04
18. . . . .	1.93	18.8	1.10 ①	1.50	1.80 ①	12.8	0.73	0.04
19. . . . .	1.91	17.8	0.93	0.47	1.52	6.7	0.71	0.03
20. . . . .	1.91	17.8	1.10 ①	1.50	1.35	4.4	0.71	0.03
21. . . . .	1.76	11.2	1.20 ①	2.6	1.23	2.9	0.68	0.02
22. . . . .	1.72	10.0	1.32	4.0	1.19	2.4	0.61	0.00
23. . . . .	1.72	10.0	1.35	4.4	1.15	2.0	0.53	0.01
24. . . . .	1.64	8.4	1.35	4.4	1.10	1.50	0.70	0.02
25. . . . .	1.63	8.2	1.32	4.0	0.93	0.47	0.67	0.01
26. . . . .	1.58 ①	7.5	1.31	3.9	0.90	0.35	0.65	0.01
27. . . . .	1.52	6.7	1.50 ①	6.4	0.83	0.16	0.63	0.01
28. . . . .	1.51 ①	6.5	1.64	8.4	0.76	0.06	0.63	0.01
29. . . . .	1.50	6.4	3.44	108	0.72	0.03	0.60	0.00
30. . . . .	1.52	6.7	2.32	39	0.73	0.04	0.53	0.00
31. . . . .			1.99	22			0.58	0.00

① Gauge heights interpolated.



Maple Creek near Maple Creek in October, 1912. Taken by G. R. Elliott.



Gap Creek near Maple Creek in October, 1912. Taken by G. R. Elliott.



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## DAILY GAUGE-HEIGHT AND DISCHARGE of Maple Creek at Maple Creek, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.63	0.01	0.53	Nil. ①	0.53	Nil. ①	0.53	Nil. ①
2.....	0.63	0.01	0.53	"	0.53	"	0.54	"
3.....	0.63	0.01	0.53	"	0.53	"	0.55	"
4.....	0.63	0.01	0.50	"	0.53	"	0.55	"
5.....	0.61	0.00	0.47	"	0.53	"	0.55	"
6.....	0.63	0.01	0.49	"	0.53	"	0.55	"
7.....	0.63	0.01	0.51	"	0.53	"	0.55	"
8.....	0.57	0.00	0.50	"	0.53	"	0.55	"
9.....	0.53	0.00	0.51	"	0.53	"	0.55	"
10.....	0.44	0.00	0.53	"	0.53	"	0.55	"
11.....	0.43	0.00	0.53	"	0.53	"	0.55	"
12.....	0.43	0.00	0.51	"	0.53	"	0.55	"
13.....	0.43	0.00	0.51	"	0.53	"	0.55	"
14.....	0.53	0.00	0.51 ①	"	0.53	"	0.55	"
15.....	0.45	0.00	0.51	"	0.53	"	0.55	"
16.....	1.58	7.5	0.55	"	0.53	"		
17.....	1.53	6.8	0.53	"	0.53	"		
18.....	1.31	3.9	0.53	"	0.53	"		
19.....	0.93	0.47	0.53	"	0.53	"		
20.....	0.83	0.16	0.53	"	0.53	"		
21.....	0.63	0.01	0.53	"	0.53	"		
22.....	0.61	0.00	0.53	"	0.57	"		
23.....	0.59	0.00	0.53	"	0.57	"		
24.....	0.57	0.00	0.53	"	0.57	"		
25.....	0.57	0.00	0.53	"	0.57	"		
26.....	0.58	0.00	0.53	"	0.53	"		
27.....	0.61	0.00	0.53	"	0.53	"		
28.....	0.57	0.00	0.53	"	0.55	"		
29.....	0.57	0.00	0.53	"	0.55	"		
30.....	0.57	0.00	0.53	"	0.53	"		
31.....	0.58	0.00			0.53	"		

① Gauge heights interpolated.

② Small trickle. Water standing in pools.

## MONTHLY DISCHARGE of Maple Creek at Maple Creek, for 1912.

(Drainage area 87 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	446.	6.4	110.	1.26	1.41	6,521.
May.....	114.	0.47	16.8	0.193	0.22	1,033.
June.....	105.	0.03	8.50	0.098	0.11	506.
July.....	1.60	0.00	0.13	0.002	0.002	8.
August.....	7.5	0.00	0.08	0.0009	0.001	5.
September.....						Nil. ①
October.....						Nil. ①
November.....						Nil. ①
The period.....					1.743	8,073.

① Water standing in pools.

## MAPLE CREEK NEAR MAPLE CREEK.

This station was established on May 4, 1910, by H. R. Carscallen. It is one mile and a half north of the town of Maple Creek, at the highway bridge east of the S. E.  $\frac{1}{4}$  Sec. 28, Tp. 11 Rge. 16, W. 3rd Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is fastened to a pile in the middle of the downstream side of the bridge. The zero of the gauge (elev. 81.60) is referred to

a permanent iron bench mark (assumed elev. 100.00), situated at the west road fence, 100 feet south and 29 feet west of the southeast corner of the bridge.

The channel is straight for 100 feet above and 10 feet below the gauge. Both banks are high, sandy and not liable to overflow. The bed is sandy and liable to shift.

Discharge measurements are made during high stages with a current meter from the downstream side of the bridge. The initial point for soundings is the face of the left abutment and is marked on the side of the bridge beam by "O" in white paint. The current is not at right angles to the cross section and a correction is applied to the area. During ordinary stages gaugings are made upstream by wading, and during low stages a weir is used.

During 1912, the gauge was read by Miss Kate Williams.

### DISCHARGE MEASUREMENTS of Maple Creek near Maple Creek, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 27	M. H. French				6 72	53 1 ①
May 9.	G. R. Elliott.	29 0	57 6	0 92	4 345	52 7
June 8.	do	22 0	26 6	0 13	2 92	3 40
Aug. 15.	do				2 34	①
Aug. 16.	do	33 2	66 6	0.48	4 315	32 3
Sept. 17	do				2 39	①
Oct. 22	do				2 41	0 20
Nov. 16	do				2 31	0 08

① Ice conditions.

② Too small to measure with 24 inch weir.

### DAILY GAUGE-HEIGHT AND DISCHARGE of Maple Creek near Maple Creek, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	6.59	195	3.15	7.3	3 40 ①	13.0	2.56	0.59
2	6.96	219	3.15 ①	7.3	3 34	11.4	2.56	0.59
3	6.58	195	3.15	7.3	3 27	9.8	2.54	0.52
4	7.33	243	3.21 ①	8.5	3 14	7.1	2.54	0.52
5	6.56	194	3.26	9.6	3.14	7.1	2.65	1.00
6	5.36	117	3.28	10.0	3 03	5.1	2.77	1.81
7	4.81	83	3.38	12.4	2 98	4.3	2.77	1.81
8	4.81	83	4.55	66	2 94	3.7	2.75	1.65
9	4.96	92	4.55	66	2 88	2.9	2.70	1.30
10	5.21	108	3.90	30	2 84 ①	2.4	2.66	1.06
11	5.54	129	3.61	19.3	2 80	2.0	2.53	0.49
12	5.95	155	3.36	11.9	2.74	1.58	2.44	0.26
13	4.36	54	3.23	8.9	3 09	22	2.44	0.26
14	3.86	28	3.15	7.3	3 80 ①	26	2.52	0.46
15	3.56	17.7	3.15	7.3	4 20 ①	45	2.56	0.59
16	3.62	19.7	3.15	7.3	5.15	104	2.50	0.40
17	3.05	5.4	3.06	5.6	3.81	31	2.46	0.30
18	3.64	20	3.07 ①	5.8	3 60 ①	19	2.46	0.30
19	3.64	20	3.08	6.0	3.18	7.9	2.44	0.26
20	3.55	17.4	3.10 ①	6.3	3 03	5.1	2.46	0.30
21	3.39	12.7	3.11 ①	6.5	2 99	4.4	2.42	0.23
22	3.35	11.6	3.13	6.9	2 96	4.0	2.40	0.19
23	3.34	11.4	2.96	4.0	2 80	2.0	2.40	0.19
24	3.34	11.4	2.96	4.0	2 67	1.12	2.40	0.19
25	3.26	9.6	3.03	5.1	2.55	0.55	2.39	0.18
26	3.24 ①	9.1	2.96	4.0	2.46	0.30	2.38	0.16
27	3.22	8.7	3.10 ①	6.4	2.46	0.30	2.38	0.16
28	3.22 ①	8.5	3.35	11.6	2.51	0.43	2.36	0.13
29	3.23	8.9	5.27	112	2.66	1.06	2.36	0.13
30	3.16	7.5	3.96	33	2.56	0.58	2.44	0.26
31			3.55	17.4			2.46	0.30

① Gauge height interpolated.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Maple Creek near Maple Creek, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2.46	0.30	2.48	0.35	2.36	0.13	2.36	0.13
2.	2.44	0.26	2.44	0.26	2.36	0.13	2.36	0.13
3.	2.44	0.26	2.44	0.26	2.36	0.13	2.36	0.13
4.	2.46	0.30	2.44	0.26	2.36	0.13	2.36	0.13
5.	2.46	0.30	2.42	0.23	2.36	0.13	2.36	0.13
6.	2.46	0.30	2.44	0.26	2.36	0.13	2.36	0.13
7.	2.46	0.30	2.44	0.26	2.36	0.13	2.38	0.16
8.	2.45	0.28	2.42	0.23	2.37①	0.15	2.38	0.16
9.	2.40	0.19	2.44	0.26	2.37①	0.15	2.38	0.16
10.	2.38	0.16	2.43	0.24	2.38	0.16	2.38	0.16
11.	2.40	0.19	2.43	0.24	2.38	0.16	2.38	0.16
12.	1.96	0.00	2.43	0.24	2.38	0.16	2.38	0.16
13.	1.96	0.00	2.44	0.26	2.38	0.16	2.38	0.16
14.	2.36	0.13	2.42①	0.23	2.36	0.13	2.36	0.13
15.	2.30	0.07	2.39	0.18	2.36	0.13	2.36	0.13
16.	4.32	51	2.37	0.15	2.36	0.13		
17.	3.96	33	2.35	0.12	2.36	0.13		
18.	3.31	10.7	2.35	0.12	2.36	0.13		
19.	2.46	0.30	2.37	0.15	2.36	0.13		
20.	2.45	0.28	2.36	0.13	2.36	0.13		
21.	2.44	0.26	2.35	0.12	2.36	0.13		
22.	2.43	0.24	2.35	0.12	2.36	0.13		
23.	2.41	0.21	2.37	0.15	2.41	0.21		
24.	2.40	0.19	2.37	0.15	2.41	0.21		
25.	2.41	0.21	2.38	0.16	2.41	0.21		
26.	2.42	0.23	2.38	0.16	2.40	0.21		
27.	2.47	0.33	2.36	0.13	2.40	0.21		
28.	2.44	0.26	2.35	0.12	2.38	0.16		
29.	2.42	0.23	2.36	0.13	2.38	0.16		
30.	2.44	0.26	2.36	0.13	2.38	0.16		
31.	2.44	0.26			2.38	0.16		

① Gauge height interpolated.

MONTHLY DISCHARGE of Maple Creek near Maple Creek, for 1912.

(Drainage area 95 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	243.	5.4	69.8	0.735	0.82	4,153.
May.....	112.	4.0	16.8	0.177	0.20	1,033.
June.....	104.	0.30	11.5	0.121	0.14	684.
July.....	1.81	0.13	0.53	0.006	0.007	33.
August.....	51.	0.00	3.26	0.034	0.004	200.
September.....	0.35	0.12	0.193	0.002	0.002	11.
October.....	0.21	0.13	0.152	0.002	0.002	9.
November (1-15).....	0.16	0.13	0.144	0.002	0.001	4.
The period.....					1.17	6,127.



## WHITE DITCH NEAR CYPRESS.

This station was established on June 15, 1911, by W. A. Fletcher. It is located on the S.W.  $\frac{1}{4}$  Sec. 1, Tp. 9, Rge. 27, W. 3rd Mer., about sixty feet below the headgate of the ditch.

The gauge, which is a plain staff divided into feet and tenths, is nailed to a post driven in the ditch. The zero of the gauge (elev. 100.18) is referred to the top of a stump (assumed elev. 100.00), situated on the left bank and upstream from the gauge.

The channel is straight above the station and curved below. The left bank is low but not liable to overflow. The right bank is a side-hill. The channel is clean gravel.

Discharge measurements are made with a weir.

Sufficient measurements were not made in 1912 to compute the daily discharge. Water was used during May, June, and part of July, the discharge averaging about 0.3 cu. ft. per sec.

## GAP CREEK AT SMALL'S RANCH.

This station was established April 25, 1909, by F. T. Fletcher. It is located on the S.E.  $\frac{1}{4}$  Sec. 4, Tp. 10, Rge. 27, W. 3rd Mer., 1,000 feet west of the surveyed trail from Maple Creek to Tenmile Police Detachment, and about twelve miles south of Maple Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is fastened to a post sunk in the bed of the stream at the right bank. It is situated at the road allowance between Secs. 3 and 4, Tp. 10, Rge. 27, W. 3rd Mer., and is just above the point where McShane Creek joins it. The zero of the gauge (elev. 66.63) is referred to a permanent iron bench mark (assumed elev. 100.00), situated at the McShane Creek bridge about 1,000 feet south of the gauge.

The channel is straight for 60 feet above and 500 feet below the station. The right bank is high and will not overflow except at very extreme flood stages; the left bank is much higher than the right and will not overflow at any stage of the stream. The bed of the stream is composed of loose, coarse gravel. The current is sluggish.

Discharge measurements are made at ordinary stages with a current meter by wading, and from a cable car at high stages. The initial point for soundings is a seven-eighths inch iron pin on the right bank, 226 feet upstream from the gauge.

During 1912, the gauge was read by William Small.

No water was diverted during 1912 by the irrigation schemes above this station.

## DISCHARGE MEASUREMENTS of Gap Creek at Small's Ranch, in 1912.

Date.	Hydrographer.	Wldth.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 4 .....	M. H. French.....	24 0	24.6	0 59	2.45	14.46
May 31 .....	O. H. Hoover.....	.....	.....	.....	2.41	8.42
June 5 .....	G. R. Elliott.....	.....	.....	.....	2.11	2.93
July 13. ....	do .....	.....	.....	.....	1.91	Nil. ①
Aug. 14. ....	do .....	.....	.....	.....	1.74	Nil. ①
Sept. 14. ....	do .....	.....	.....	.....	1.86	Nil. ①
Oct. 19 .....	do .....	.....	.....	.....	1.91	Nil. ①
Nov. 15 .....	do .....	.....	.....	.....	2.03	0 23

① Water standing in pools.

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## DAILY GAUGE HEIGHT AND DISCHARGE of Gap Creek at Small's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.31	7.0	2.26	5.2	1.91	NIL. ①
2.....			2.31	7.0	2.23	4.2	1.91	"
3.....			2.46	15.3	2.16	2.4	1.91	"
4.....	4.40	540	2.44	13.8	2.19	3.2	1.91	"
5.....	3.60	290	2.39	10.7	2.12	1.60	1.91	"
6.....	3.03	110	2.58	28	2.09	1.04	1.91	"
7.....	2.68	40	2.71	44	2.06	0.56	1.91	"
8.....	3.36	212	2.81	59	2.04	0.34	1.91	"
9.....	3.49	254	2.56	26	2.04	0.34	1.93	"
10.....	3.25	178	2.46	15.3	2.02	0.22	1.91	"
11.....	3.45	240	2.36	9.2	1.96	0.04	1.91	"
12.....	3.01	106	2.31	7.0	1.96	0.04	1.91	"
13.....	2.79	56	2.26	5.2	1.94	0.02	1.91	"
14.....	2.71	44	2.21	3.7	1.94	0.02	1.91	"
15.....	2.70	42	2.21	3.7	2.65	36	1.91	"
16.....	2.66	37	2.19	3.2	2.49	18.1	1.91	"
17.....	2.61	31	2.19	3.2	2.31	7.0	1.91	"
18.....	2.61	31	2.16	2.4	2.19	3.2	1.91	"
19.....	2.56	26	2.16	2.4	2.16	2.4	1.90	"
20.....	2.51	20	2.16	2.4	2.06	0.56	1.90	"
21.....	2.46	15.3	2.16	2.4	2.01	0.16	1.90	"
22.....	2.46	15.3	2.16	2.4	2.01	0.16	1.90	"
23.....	2.44	13.8	2.26	5.2	1.99	0.08	1.89	"
24.....	2.42	12.5	2.26	5.2	1.96	0.04	1.89	"
25.....	2.41	11.8	2.21	3.7	1.93	0.01	1.88	"
26.....	2.37	9.7	2.19	3.2	1.91	NIL ①	1.87	"
27.....	2.39	10.7	2.36	9.2	1.91	"	1.86	"
28.....	2.36	9.2	3.06	120	1.91	"	1.83	"
29.....	2.31	7.0	2.61	31	1.91	"	1.80	"
30.....	2.32	7.4	2.46	15.3	1.91	"	1.77	"
31.....			2.36	9.2			1.76	"

① Water standing in pools.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Gap Creek at Small's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	1.74	Nil. ①	1.84	Nil. ①	1.85	Nil. ①	2.04	0.34
2.	1.74	"	1.84	"	1.85	"	2.04	0.34
3.	1.74	"	1.85	"	1.85	"	2.05	0.40
4.	1.75	"	1.87	"	1.85	"	2.05	0.40
5.	1.77	"	1.87	"	1.85	"	2.05	0.40
6.	1.77	"	1.87	"	1.85	"	2.05	0.40
7.	1.76	"	1.86	"	1.85	"	2.05	0.40
8.	1.75	"	1.86	"	1.85	"	2.06	0.56
9.	1.75	"	1.86	"	1.86	"	2.06	0.56
10.	1.75	"	1.86	"	1.88	"	2.06	0.56
11.	1.74	"	1.85	"	1.90	"	2.05	0.40
12.	1.74	"	1.85	"	1.90	"	2.05	0.40
13.	1.74	"	1.85	"	1.90	"	2.05	0.40
14.	1.74	"	1.86	"	1.89	"	2.04	0.34
15.	1.74	"	1.86	"	1.88	"	2.03	0.28
16.	2.16	2.6	1.86	"	1.88	"		
17.	2.01	0.16	1.86	"	1.87	"		
18.	1.91	Nil. ①	1.86	"	1.87	"		
19.	1.87	"	1.87	"	1.91	0.00		
20.	1.87	"	1.87	"	1.95	0.02		
21.	1.84	"	1.88	"	1.99	0.08		
22.	1.84	"	1.88	"	1.99	0.08		
23.	1.84	"	1.88	"	1.99	0.08		
24.	1.84	"	1.88	"	1.99	0.08		
25.	1.83	"	1.88	"	2.01	0.16		
26.	1.83	"	1.87	"	2.04	0.34		
27.	1.85	"	1.87	"	2.04	0.34		
28.	1.85	"	1.87	"	2.03	0.28		
29.	1.85	"	1.85	"	2.04	0.34		
30.	1.85	"	1.85	"	2.04	0.34		
31.	1.85	"			2.04	0.34		

① Water standing in pools.

## MONTHLY DISCHARGE of Gap Creek at Small's Ranch, for 1912.

(Drainage area 129 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (4-30)	540.	7.0	87.8	0.681	0.68	4,702.
May	120.	2.4	15.3	0.119	0.14	941.
June	36.	0.00	2.90	0.022	0.02	173.
July						
August	2.6	0.00	0.089	0.0007	0.0008	6.
September						
October	0.34	0.00	0.080	0.0006	0.0007	5.
November (1-15)	0.56	0.28	0.412	0.003	0.002	12.
The period					0.84	5,839.

## MC SHANE CREEK AT SMALL'S RANCH.

This station was established April 23, 1909, by F. T. Fletcher. It is located on the S.W. ¼ Sec. 3, Tp. 10, Rge. 27, W. 3rd Mer., at the highway bridge on the surveyed trail from Maple Creek to Tennile Police Detachment, about 12 miles south of Maple Creek. It is about 600 feet above the mouth of the creek and about 500 feet from Wm. Small's house.

The gauge, which is a plain staff graduated to feet and hundredths, is attached firmly to the right abutment on the downstream side of the bridge. The zero of the gauge (elev. 85.71) is re-

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ferred to a permanent iron bench mark (assumed elev. 100.00), located just east of the bridge upon the north side of the diversion of the road allowance. It stands about four inches above ground and is protected with stones.

The channel is straight for 100 feet above and 200 feet below the station. Both banks are high and not liable to overflow. The bed of the stream is composed of coarse gravel and shifts at high stages. The current is swift.

Highwater measurements are made from the downstream side of the bridge. The initial point for soundings is the inner face of the right abutment of the bridge. Low water measurements are made near the gauge by wading, and at very low stages a weir is used.

During 1912, the gauge was read by William Small.

The period of flow of this creek is short. It becomes dry usually in the month of June and remains so during the remainder of the season, except during very heavy rains. Mr. Small diverted water above this station in 1912 during the month of May.

## DISCHARGE MEASUREMENTS of McShane Creek at Small's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 4. ....	M. H. French.....	6.0	3 35	0.704	1.02	2.36
May 31. ....	O. H. Hoover.....				1.07	1.85
June 5. ....	G. R. Elliott.....				0.79	0.07
July 13. ....	do .....					Dry.
Aug. 14. ....	do .....					Dry.
Sept. 14. ....	do .....					Dry.
Oct. 19. ....	do .....					Dry.
Nov. 15. ....	do .....					Dry.

## DAILY GAUGE-HEIGHT AND DISCHARGE of McShane Creek at Small's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1. ....	1.56	12.2	0.92	1.04	0.90	0.80	Dry.	Nil.
2. ....	1.60	13.0	0.93	1.16	0.92	1.04	"	"
3. ....	1.62	13.3	1.07	3.2	0.85	0.40	"	"
4. ....	1.48	10.7	0.97	1.66	0.85	0.40	"	"
5. ....	1.34	8.1	1.00	2.0	0.79	0.09	"	"
6. ....	1.18	5.2	1.23	6.1	0.43	Nil.	"	"
7. ....	1.16	4.8	1.17	5.0	0.22	"	"	"
8. ....	1.32	7.8	1.25	6.5	Dry.	"	"	"
9. ....	1.33	8.0	1.12	4.1	"	"	"	"
10. ....	1.31	7.6	1.05	2.8	"	"	"	"
11. ....	1.33	8.0	1.00	2.0	"	"	"	"
12. ....	1.22	5.9	0.98	1.79	"	"	"	"
13. ....	1.12	4.1	0.94	1.28	"	"	"	"
14. ....	1.12	4.1	0.92	1.04	"	"	"	"
15. ....	1.10	3.8	0.92	1.04	1.51	11.3	"	"
16. ....	1.10	3.8	0.85	0.40	1.17	5.0	"	"
17. ....	1.08	3.4	0.76	0.04	1.00	2.0	"	"
18. ....	1.08	3.4	0.72	0.02	0.93	1.16	"	"
19. ....	1.05	2.8	0.72	0.02	0.83	0.28	"	"
20. ....	1.03	2.5	0.72	0.02	0.50	Nil.	"	"
21. ....	0.98	1.79	0.72	0.02	0.09	"	"	"
22. ....	1.00	2.0	0.80	0.10	Dry.	"	"	"
23. ....	0.98	1.79	1.03	2.5	"	"	"	"
24. ....	0.97	1.66	0.96	1.33	"	"	"	"
25. ....	0.95	1.40	0.80	0.10	"	"	"	"
26. ....	0.93	1.16	0.70	0.01	"	"	"	"
27. ....	1.03	2.5	1.24	6.3	"	"	"	"
28. ....	0.98	1.79	1.45	10.2	"	"	"	"
29. ....	0.94	1.28	1.13	4.3	"	"	"	"
30. ....	0.95	1.40	1.04	2.7	"	"	"	"
31. ....			0.95	1.40			"	"

## DAILY GAUGE-HEIGHT AND DISCHARGE of McShane Creek at Small's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	Dry.	Nil.	Dry.	Nil.	Dry.	Nil.	Dry.	Nil.
2.....	"	"	"	"	"	"	"	"
3.....	"	"	"	"	"	"	"	"
4.....	"	"	"	"	"	"	"	"
5.....	"	"	"	"	"	"	"	"
6.....	"	"	"	"	"	"	"	"
7.....	"	"	"	"	"	"	"	"
8.....	"	"	"	"	"	"	"	"
9.....	"	"	"	"	"	"	"	"
10.....	"	"	"	"	"	"	"	"
11.....	"	"	"	"	"	"	"	"
12.....	"	"	"	"	"	"	"	"
13.....	"	"	"	"	"	"	"	"
14.....	"	"	"	"	"	"	"	"
15.....	"	"	"	"	"	"	"	"
16.....	1.10	3.75	"	"	"	"	"	"
17.....	0.80	0.10	"	"	"	"	"	"
18.....	Dry.	Nil.	"	"	"	"	"	"
19.....	"	"	"	"	"	"	"	"
20.....	"	"	"	"	"	"	"	"
21.....	"	"	"	"	"	"	"	"
22.....	"	"	"	"	"	"	"	"
23.....	"	"	"	"	"	"	"	"
24.....	"	"	"	"	"	"	"	"
25.....	"	"	"	"	"	"	"	"
26.....	"	"	"	"	"	"	"	"
27.....	"	"	"	"	"	"	"	"
28.....	"	"	"	"	"	"	"	"
29.....	"	"	"	"	"	"	"	"
30.....	"	"	"	"	"	"	"	"
31.....	"	"	"	"	"	"	"	"

## MONTHLY DISCHARGE of McShane Creek at Small's Ranch, for 1912.

(Drainage area 24 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	13.3	1.16	4.97	0.207	0.23	296.
May.....	10.2	0.01	2.27	0.095	0.11	140.
June.....	11.3	0.00	0.749	0.031	0.03	45.
July.....	"	"	"	"	"	Nil.
August.....	3.8	0.00	0.124	0.005	0.006	8.
September.....	"	"	"	"	"	Nil.
October.....	"	"	"	"	"	Nil.
November (1-15).....	"	"	"	"	"	Nil.
The period.....	"	"	"	"	0.38	489.

## GAP CREEK NEAR MAPLE CREEK.

This station was established on May 3, 1910, by H. R. Carscallen. It is located at the traffic bridge on the road allowance east of the N.E.  $\frac{1}{4}$  Sec. 31, Tp. 11, Rge. 26, W. 3rd Mer., about four and a half miles northwest of the town of Maple Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the right abutment on the downstream side of the bridge. The zero of the gauge (elev. 81.61) is referred to a permanent iron bench mark (assumed elev. 100.00), situated 95 feet east of the northeast corner of the bridge.

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The channel is straight for about 130 feet above the station and 60 feet below. The left bank is high and the right low, but not liable to overflow. The bed is sandy and shifts during flood stages.

During high water, discharge measurements are made from the bridge, and during ordinary stages by wading. The initial point for soundings is marked on the north end of the bridge in red paint. The bridge is not at right angles to the direction of the current and a coefficient is applied to the measured discharge to obtain the actual discharge. The discharge is determined in extreme low water by means of a weir.

During 1912, the gauge was read by Miss Kate Williams.

## DISCHARGE MEASUREMENTS of Gap Creek near Maple Creek, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 15	G. H. Whyte	47 0	46 50	1.49	2.445	69 27
May 9	G. R. Elliott	50 0	57 10	0 80	2 61	45 61
June 8	do	33 2	10 00	0 28	1 48	2 82
Aug. 16	do	29 0	6 30	0 38	1 37	2 39
Sept. 17	do				1 15	Nil. ①
Oct. 22	do				1 18	0 06
Nov. 16	do	37 0	4 91	0 15	1 32	0 73

① Point of zero flow.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Gap Creek near Maple Creek, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			1.96	13.6	1.90①	11.7	1.01	Nil.②
2			1.92①	12.3	1.76	8.2	1.28	0.51
3	7.40	966	1.89	11.4	1.68	6.4	1.26	0.37
4	8.03	1124	1.95①	13.2	1.59	4.7	1.22	0.18
5	6.97	863	2 05	17.0	1.59	4.7	1.22	0.18
6	4.17	262	2 02	15.8	1.56	4.2	1.22	0.18
7	3.77	190	2 20	23	1.54	3.8	1.23	0.22
8	4.17	262	2.76	58	1.52	3.5	1.23	0.22
9	4.37	300	2.56	43	1.48	2.8	1.25	0.30
10	4.77	380	2.22	24	1.48①	2.8	1.25	0.30
11	5.27	484	2.11	19.4	1.48	2.8	1.25	0.30
12	3.74	185	1.92	12.3	1.36	1.27	1.27	0.44
13	4.16	259	1.89	11.4	1.35	1.15	1.27	0.44
14	2.77	59	1.75	8.0	1.50①	3.2	1.27	0.44
15	2.45	36	1.75	8.0	2.30①	28	1.25	0.30
16	2.56	43	1.74	7.7	2.36	31	1.24	0.26
17	2.46	37	1.67	6.2	1.99	14.6	1.23	0.22
18	2.46	37	1.45①	2.4	1.80①	9.1	1 20	0.10
19	2.36	31	1.35	1.15	1.64	5.7	1 20	0.10
20	2.36	31	1.40	1.75	1.56	4.2	1.18	0.06
21	2.17	22	1.60①	4.9	1.47	2.9	1.17	0.04
22	2.17	22	1.73	7.5	1.45	2.4	1.15	0.00
23	2.17	22	1.36	1.27	1.39	1.63	1.15	Nil.③
24	2.09	18.6	1.36	1.27	1.34	1.05	1.10	*
25	2.09	18.6	1.36	1.27	1.32	0.85	1.05	*
26	2.03	16.2	1.56	4.2	1.32	0.85	1 00	*
27	2.00①	15.0	1.65①	5.8	1.07	Nil.③	0.95	*
28	1 98①	14.3	1.85	10.4	1.00	*	Dry.	*
29	1.96	13.6	3.09	92	1 00	*	*	*
30	1.96	13.6	2.36	31.0	1 00	*	*	*
31			2.01	15.4			*	*

① Gauge heights interpolated.

② Water standing in pools.

③ Stream frozen.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Gap Creek near Maple Creek, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	Dry.	Nil.①	Dry.	Nil.①	1.15	Nil.②	1.15	Nil.①
2.....	"	"	"	"	1.15	"	1.15	"
3.....	"	"	"	"	1.15	"	1.18	.06
4.....	"	"	"	"	1.15	"	1.18	.06
5.....	"	"	"	"	1.15	"	1.15	Nil.②
6.....	"	"	"	"	1.15	"	1.15	"
7.....	"	"	"	"	1.15	"	1.10	"
8.....	"	"	"	"	1.15①	"	1.10	"
9.....	"	"	"	"	1.15①	"	1.10	"
10.....	"	"	"	"	1.15	"	1.10	"
11.....	"	"	"	"	1.15	"	1.10	"
12.....	"	"	"	"	1.15	"	1.10	"
13.....	"	"	"	"	1.15	"	1.10	"
14.....	"	"	"	"	1.15	"	1.10	"
15.....	"	"	"	"	1.15	"	1.10	"
16.....	1.38	1.51	"	"	1.15	"	"	"
17.....	1.32	0.85	1.15	"	1.15	"	"	"
18.....	1.37	1.39	1.15	"	1.15	"	"	"
19.....	1.33	0.95	1.15	"	1.15	"	"	"
20.....	1.17	0.04	1.15	"	1.15	"	"	"
21.....	1.17	0.04	1.15	"	1.15	"	"	"
22.....	1.15	Nil.②	1.15	"	1.18	0.06	"	"
23.....	1.13	"	1.15	"	1.18	0.06	"	"
24.....	1.11	"	1.15	"	1.18	0.06	"	"
25.....	1.11	"	1.15	"	1.18	0.06	"	"
26.....	1.12	"	1.15	"	1.17	0.04	"	"
27.....	1.15	"	1.15	"	1.17	0.04	"	"
28.....	1.07	"	1.15	"	1.17	0.04	"	"
29.....	1.05	"	1.15	"	1.15	0.00	"	"
30.....	1.00	"	1.15	"	1.15	0.00	"	"
31.....	0.95	"	"	"	1.15	0.00	"	"

① Gauge heights interpolated.

② Water standing in pools.

## MONTHLY DISCHARGE of Gap Creek near Maple Creek, for 1912.

(Drainage area 295 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (3-30).....	1124	13.6	204	0.691	0.72	11,330
May.....	92	1.15	15.6	0.053	0.06	959
June.....	31	0.00	5.45	0.018	0.02	324
July.....	0.51	0.00	0.17	0.0005	0.0006	10
August.....	1.51	0.00	0.15	0.0005	0.0006	9
September.....	"	"	"	"	"	Nil.
October.....	0.06	0.00	0.01	"	"	Nil.
November (1-15).....	0.06	0.00	"	"	"	Nil.
The period.....	"	"	"	"	0.80	12,632

## MANY ISLAND LAKE DRAINAGE BASIN.

*General Description.*

Many Island Lake, about 25 square miles in area, is situated on the boundary line between the provinces of Alberta and Saskatchewan, about ten miles north of the town of Walsh. It is the farthest west of the several lakes which receive the drainage of the north slope of the Cypress Hills. The water is shallow and alkaline. Its only source of water supply is Mackay Creek with its tributaries, Story and Boxelder Creeks.

The topography of the basin is very rough and the creek slopes are heavy. The basin is bare of trees except in the hills near the sources of the streams. The creek channels are deep and the beds are mostly gravel.

The precipitation during 1912 was about 13 inches. This was fairly evenly distributed through the summer, no month receiving a large amount.

The spring break-up of 1912 took place about March 28. This was the only flood of the year. The deep channels of the creeks prevented much flooding of the banks. No damage of any extent was caused by floods.

The creeks of this basin become dry in June or even earlier and generally remain so for the rest of the year.

## EAST BRANCH OF MACKAY CREEK AT GRANT'S RANCH.

This station was established on October 13, 1911, by M. H. French. It is located in the N.W.  $\frac{1}{4}$  Sec. 36, Tp. 10, Rge. 1, W. 4th Mer., about 100 feet north of Arthur Grant's house. It is about five miles south of Walsh and one mile above the junction of the east and west branches of Mackay Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post sunk in the bed of the stream near the right bank. The zero of the gauge (elev. 75.85) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the right bank, in line with the cross section and 100 feet from the initial point.

The channel is straight for 50 feet above and below the station. The right bank is a cut bank and will never overflow. The left bank is rather low, covered with brush, and will overflow in extreme floods. The bed of the channel is composed of coarse gravel and will not shift.

Discharge measurements are made with a current meter by wading. The initial point for soundings is the face of a five inch stake on the right bank, ten feet from the water's edge and is well protected by a mound of stones. The final point is a willow stump on the left bank, 45.1 feet from the initial point and protected by a mound of stones.

During 1912, the gauge was read by Arthur Grant.

## DISCHARGE MEASUREMENTS of East Branch of Mackay Creek at Grant's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 13.....	G. R. Elliott .....	18.0	14.60	0.62	1.02	9.06
June 11.....	do .....	15.0	8.63	0.17	0.67	1.48
July 20.....	do .....					Nil. ①
Aug. 17.....	do .....					Nil. ①
Sept. 19.....	do .....					Nil. ①
Oct. 26.....	do .....				0.34	Nil. ①
Nov. 20.....	do .....				0.33	Nil. ①

① Water standing in pools.



## DAILY GAUGE-HEIGHT AND DISCHARGE of East Branch of Mackay Creek, at Grant's Ranch, for 1912.

DAY.	April		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.10	662 <sup>①</sup>	1.12	13.5	1.07	11.1	0.40	0.02
2.....	4.11	670	1.09	12.0	1.00	8.2	0.38	0.01
3.....	5.10	1137	1.31	25	0.93	5.9	0.38	0.01
4.....	3.75	525	1.32	26	0.88	4.6	0.41	0.04
5.....	3.50	443	1.23	19.9	0.85	4.0	0.39	0.02
6.....	2.00	103	1.19	17.4	0.85	4.0	0.39	0.02
7.....	1.85	79	1.41	33	0.80	3.0	0.38	0.01
8.....	2.26	143	1.37	30	0.77	2.6	0.40	0.02
9.....	2.85	265	1.27	23	0.72	2.0	0.38	0.01
10.....	2.70 <sup>②</sup>	230	1.21	18.6	0.67	1.45	0.38	0.01
11.....	2.60 <sup>③</sup>	210	1.17	16.2	0.62	1.01	0.36	0.01
12.....	2.55	200	1.10	12.4	0.52	1.01	0.38	0.01
13.....	2.30	150	1.04	9.8	0.59	0.79	0.38	0.01
14.....	1.67	56	1.00	8.2	0.58	0.73	0.38	0.01
15.....	1.60	49	0.99	7.8	0.72	2.0	0.38	0.01
16.....	1.43	35 <sup>④</sup>	0.95	6.4	1.05	10.2	0.37	0.01
17.....	1.37	30	0.99	7.8	0.99	7.8	0.37	0.01
18.....	1.35	28	0.96	6.8	0.91	5.3	0.37	0.01
19.....	1.30	25	0.94	6.2	0.74	2.2	0.36	0.01
20.....	1.30	25	0.92	5.6	0.62	1.01	0.29	Nil <sup>⑤</sup>
21.....	1.30	25	0.90	5.0	0.57	0.67	0.30	*
22.....	1.22	19.2	0.85	4.0	0.56	0.61	0.29	*
23.....	1.22	19.2	0.90 <sup>⑥</sup>	5.0	0.53	0.45	0.29	*
24.....	1.24	20	1.00	8.2	0.46	0.14	0.30	*
25.....	1.19	17.4	0.96	6.8	0.43	0.07	0.29	*
26.....	1.15	15.0	0.85	4.0	0.40	0.02	0.50	*
27.....	1.18	16.8	1.05	10.2	0.38	0.01	0.27	*
28.....	1.19	17.4	2.20	1.33	0.36	0.01	0.25	*
29.....	1.11	13.0	1.50	40	0.35	0.00	0.25	*
30.....	1.12	13.5	1.25	21	0.34	0.00	0.25	*
31.....			1.20	18.0			0.23	*

① Discharges approximate, April 1 to 16, depending upon slope measurement.

② Gauge height interpolated.

③ Water standing in pools.

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of East Branch of Mackay Creek, at Grant's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0.25	Nil. ②	Dry.	Nil. ②	0.25	Nil. ②	0.35	Nil. ②
2	0.25	"	"	"	0.25	"	0.35	"
3	0.23	"	"	"	0.24	"	0.35	"
4	0.22	"	"	"	0.24	"	0.35	"
5	0.22	"	"	"	0.25	"	0.34	"
6	0.20	"	"	"	0.25	"	0.34	"
7	0.19	"	"	"	0.26	"	0.34	"
8	0.17	"	"	"	0.27	"	0.34	"
9	0.17	"	"	"	0.28	"	0.34	"
10	0.16	"	"	"	0.30	"	0.34	"
11	0.16	"	"	"	0.30	"	0.34	"
12	0.17	"	"	"	0.31	"	0.34	"
13	0.17	"	"	"	0.33	"	0.34	"
14	0.17	"	"	"	0.33	"	0.34	"
15	0.15	"	"	"	0.34	"	0.34	"
16	0.13	"	"	"	0.35	"		
17	0.16	"	"	"	0.35	"		
18	0.09	"	"	"	0.36	"		
19	0.08	"	"	"	0.35	"		
20	0.06	"	"	"	0.35	"		
21	Dry.	"	"	"	0.35	"		
22	"	"	"	"	0.35	"		
23	"	"	"	"	0.35	"		
24	"	"	"	"	0.36	"		
25	"	"	0.19	"	0.35	"		
26	"	"	0.19	"	0.34	"		
27	"	"	0.21	"	0.35	"		
28	"	"	0.24	"	0.35	"		
29	"	"	0.26	"	0.35	"		
30	"	"	0.25	"	0.35	"		
31	"	"			0.35	"		

① Water standing in pools.

## MONTHLY DISCHARGE of East Branch of Mackay Creek at Grant's Ranch, for 1912.

(Drainage area, 77 square miles.)

MONTH.	DISCHARGE IN SECOND FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April	1,137	13.0	175	2.27	2.53	10,396
May	133	4.0	18.1	0.235	0.27	1,112
June	11.1	0.0	2.69	0.035	0.04	160
July	0.04	0.0	0.001	0.0001	0.0001	1
August						Nil. ①
September						Nil. ①
October						Nil. ②
November						Nil. ②
The period...					2.84	11,660

① Water standing in pools.

## WEST BRANCH OF MACKAY CREEK AT SCHNEIDER'S RANCH.

This station was established on October 12, 1911, by M. H. French. It was located on the S.W.  $\frac{1}{4}$  Sec. 23, Tp. 10, Rge. 2, W. 4th Mer. It was abandoned on September 20, 1912, on account of the lack of an observer, and a new station was established at Schnell's ranch about six miles downstream.

## WEST BRANCH OF MACKAY CREEK AT SCHNELL'S RANCH.

This station was established September 20, 1912, by G. R. Ellicott. It is located on the N.W.  $\frac{1}{4}$  Sec. 27, Tp. 10, Rge. 1, W. 4th Mer., seven miles south of the village of Walsh, and is two miles above the junction of the east and west branches of Mackay Creek and 380 feet from Schnell's house.

The gauge, which is a plain staff, graduated in feet and hundredths, is nailed to a post sunk in the bed of the stream near the left bank. The zero of the gauge (elev. 91.66) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the left bank, close to the middle point of the boundary between sections 27 and 34.

The channel is straight for 25 feet above and 70 feet below the station. The left bank is brush-covered loam, high and not liable to overflow. The right bank is coarse gravel, low, wooded and liable to overflow. The bed is composed of clean, coarse gravel and is not liable to shift.

Discharge measurements are usually made with a current meter by wading at the gauge, but during low stages a weir is used. The initial point for soundings is the face of a five inch wooden post, projecting two feet above ground on the left bank, and marked "I.P." in red paint.

There was no flow in the creek during 1912 after the station was established.

## MACKAY CREEK AT WALSH.

This station was established on July 29, 1909, by F. T. Fletcher. It is located at the traffic bridge one half mile south of the C. P. R. track at Walsh, and is on the N.W.  $\frac{1}{4}$  Sec. 26, Tp. 11, Rge. 1, W. 4th Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to an upright timber on the upstream side of the bridge near the right abutment. The zero of the gauge (elevation 88.92) is referred to a permanent iron bench mark (assumed elevation 100.00) located on the right bank on the downstream side of the bridge, and 77.5 ft. from the gauge.

The channel is straight for about 225 feet above and 500 feet below the station. Both banks are clean, but are liable to overflow during high stages. The bed is clean, composed of clay and not liable to shift. The current is sluggish.

During high water discharge measurements are made from the downstream side of the bridge. At low stages the discharge is measured by wading, and at extreme low water, a weir is used.

During 1912, the gauge was read by G. G. Sept.

## DISCHARGE MEASUREMENTS of Mackay Creek at Walsh, in 1912.

Date.	Hydrographer.	Width.	Area. of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 16.....	D. D. MacLeod.....	17.0	33.41	1.18	1.72	39.37
May 1.....	do .....	16.0	24.40	0.71	1.24	17.34
May 17.....	do .....	14.0	17.45	0.44	0.92	7.68
June 18.....	H. D. St. A. Smith.....	12.0	18.90	0.35	0.97	6.64
July 4.....	do .....	.....	.....	.....	.....	NIL. ①
July 18.....	do .....	.....	.....	.....	.....	NIL. ②
Aug. 1.....	do .....	.....	.....	.....	.....	NIL. ③
Aug. 6.....	do .....	.....	.....	.....	.....	NIL. ④
Aug. 22.....	do .....	.....	.....	.....	.....	NIL. ⑤
Sept. 4.....	do .....	.....	.....	.....	.....	NIL. ⑥
Sept. 19.....	do .....	.....	.....	.....	.....	NIL. ⑦
Oct. 2.....	do .....	.....	.....	.....	.....	NIL. ⑧
Oct. 15.....	do .....	.....	.....	.....	.....	NIL. ⑨
Nov. 15.....	do .....	.....	.....	.....	.....	NIL. ⑩

① Water standing in pools.

② Creek dry.

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Mackay Creek at Walsh, for 1912.

DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			5.27	210	1.24	17.4	1.30	20	③	.....
2.....			6.64	275	1.22	16.6	1.18	15	③	.....
3.....			6.80	283	1.24	17.4	1.14	13.5	③	.....
4.....			6.58	272	1.57	32	1.06	10.6	③	.....
5.....			5.02	198	1.48	28	1.00	8.7	③	.....
6.....			3.61	130	1.44	26	0.96	7.5	③	.....
7.....			2.94	98	1.69	38	0.90	6	③	.....
8.....			3.13	107	1.88	47	0.84	4.8	③	.....
9.....			3.35	117	1.58	32	0.82	4.5	③	.....
10.....			3.24	112	1.54	31	0.79	4	③	.....
11.....			4.00	149	1.48	28	0.76	3.6	③	.....
12.....			3.18	109	1.43	26	0.74	3.4	0.21	0.40
13.....			2.64	83	1.36	22	0.70	2.9	0.16	0.30
14.....			2.09	57	1.30	20	0.67	2.5	0.10	0.20
15.....			1.84	45	1.13	13.1	0.85	5.0	0.05	0.12
16.....			1.81	44	0.95	7.2	1.12	12.7	③	.....
17.....			1.70	38	0.92	6.5	1.12	12.7	③	.....
18.....			1.68	37	0.87	5.4	0.99	8.4	③	.....
19.....			1.66	36	0.85	5.2	0.84	4.8	③	.....
20.....			1.60	33	0.86	5.4	0.72	3.1	③	.....
21.....			1.49	28	0.88	5.6	0.68	2.6	③	.....
22.....			1.38	23	0.88	11.2	0.62	2.1	③	.....
23.....			1.40	24	0.87	5.4	0.55	1.66	③	.....
24.....			1.38	23	0.86	5.2	0.47	1.18	③	.....
25.....			1.36	22	0.87	5.4	0.38	0.76	③	.....
26.....	4.38	167	1.34	22	0.90	6.0	0.19	0.36	③	.....
27.....	6.82	284	1.28	17.1	1.08	11.2	0.10	0.20	③	.....
28.....	7.43	313	1.34	22	2.80	91.	0.30	0.58	③	.....
29.....	9.80	427	1.28	19.1	2.35	69	③	③	③	.....
30.....	7.43	313	1.26	18.2	1.84	45.	③	③	③	.....
31.....	3.44	122			1.48	28.	③	③	③	.....

③ Observations were commenced March 26.

③ Water standing in pools, no flow.

③ Creek dry from July 22 to end of year.

## MONTHLY DISCHARGE of Mackay Creek at Walsh, for 1912.

(Drainage area 206 square miles.)

MONTH.	DRAINAGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (26-31).....	427	122	271	1.32	0.29	3,225
April.....	283	18.2	88.4	0.43	0.48	5,260
May.....	91	5	22.6	0.11	0.13	1,390
June.....	20	Nil.	5.44	0.03	0.03	324
July.....	0.4		0.03	0.0001	0.0001	2
August.....						Nil.
September.....						Nil.
October.....						Nil.
November.....						Nil.
December.....						Nil.
The period.....					0.9301	10,201

## BOXELDER CREEK AT YOUNG'S RANCH.

This station was established May 24, 1909, by P. M. Sauder. It is located at John Young's farm on Sec. 2, Tp. 12, Rge. 30, W. 4th Mer., and is two miles east of Walsh.

The gauge, which is a plain staff graduated to feet and hundredths, is attached to a post on the right bank. The zero of the gauge (elev. 88.83) is referred to a permanent iron bench mark

(assumed elev. 100.00), located on the left bank 65 feet from the gauge and 113 feet from Mr. Young's house.

The stream flows in one channel, which is crooked both above and below the gauge. The banks are high and not liable to overflow. The bed of the stream is composed of clay.

Discharge measurements are generally made by wading at or near the gauge, but during floods it may be measured from the Canadian Pacific Railway bridge a few hundred feet below the gauge.

During 1912, the gauge was read by Mr. John Young.

### DISCHARGE MEASUREMENTS of Boxelder Creek at Young's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 16.....	D. D. MacLeod.....	9.	6.20	0.95	1 27	5.88
May 1.....	do.....	7.5	3.85	0.44	0.88	1.68
June 18.....	H. D. St. A. Smith.....	10.4	8.43	0.39	1 00	3.30
July 4.....	do.....	①				NIL.
July 18.....	do.....	①				NIL.
Aug. 1.....	do.....	①				NIL.
Aug. 6.....	do.....	①				NIL.
Sept. 4.....	do.....	①				NIL.
Sept. 19.....	do.....	①				NIL.
Oct. 2.....	do.....	①				NIL.
Oct. 15.....	do.....	①				NIL.
Nov. 15.....	do.....	①				NIL.

① Creek dry.

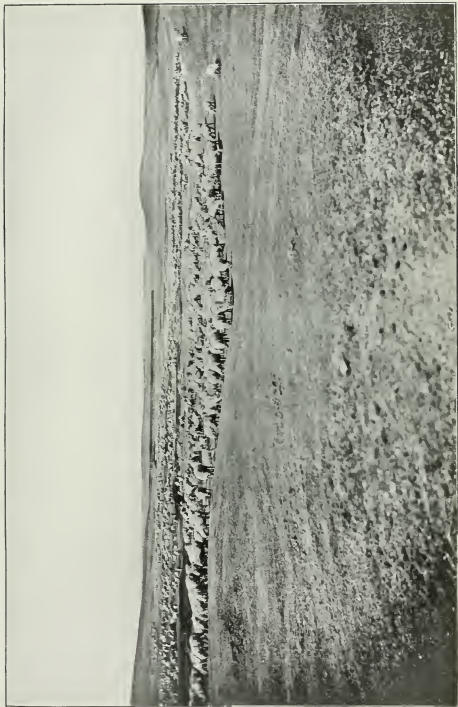
### DAILY GAUGE-HEIGHT AND DISCHARGE of Boxelder Creek, at Young's Ranch, for 1912.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			3.85	36.80	0.90	2.1	1.25	5.6
2.....			5.25	53.60	0.80	1.5	1.08	3.7
3.....			5.65	58.40	0.90	2.1	0.90	2.1
4.....			5.60	57.80	1.00	3.0	0.88	2.0
5.....			5.20	53.00	0.95	2.5	0.82	1.62
6.....			4.15	40.40	1.00	3.0	0.81	1.56
7.....			1.80	12.20	1.00	3.0	0.68	0.97
8.....			2.80	24.20	0.98	2.7	0.58	0.66
9.....			2.80	24.20	1.28	6.0	0.44	0.38
10.....			2.40	19.4	1.28	6.0	0.32	0.22
11.....			2.40	19.4	1.05	3.4	0.30	0.20
12.....			2.85	24.80	0.75	1.25	Dry.	NIL.
13.....			2.40	19.4	0.80	1.50	"	"
14.....			1.80	12.2	0.75	1.25	"	"
15.....			1.45	8.0	0.70	1.05	"	"
16.....			1.30	6.2	0.65	0.85	0.80	1.50
17.....			1.20	5.0	0.62	0.76	1.05	3.40
18.....			1.20	5.0	0.58	0.66	0.95	2.50
19.....			1.25	5.00	0.52	0.54	0.88	2.0
20.....			1.35	6.8	0.45	0.40	0.62	0.76
21.....			1.10	3.9	0.55	0.60	0.52	0.54
22.....			1.05	3.4	0.50	0.50	0.35	0.25
23.....			1.00	3.0	0.52	0.54	Dry.	NIL. ①
24.....	3.70	①	1.00	3.0	0.50	0.50	"	"
25.....	5.20		0.90	2.1	0.40	0.30	"	"
26.....	5.80		0.90	2.1	0.48	0.46	"	"
27.....	6.45		0.90	2.1	0.78	1.40	"	"
28.....	6.60		0.90	2.1	2.25	1.76	"	"
29.....	7.00		0.90	2.1	3.20	②29.0	"	"
30.....	6.65		0.90	2.1	2.08	15.2	"	"
31.....	2.75				1.52	8.8		

① Ice in stream from March 24 to April 1.

② Discharge estimated.

③ Creek dry from June 23 to the end of the year.



Martin Brothers' flock of sheep on Boxelder Creek. Taken by G. R. Elliott.



SESSIONAL PAPER No. 25d

## MONTHLY DISCHARGE of Boxelder Creek at Young's Ranch, for 1912.

(Drainage area 99 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April...	58.4	2.1	17.28	0.175	0.195	1,028
May...	29.0	0.3	3.82	0.038	0.044	235
June...	5.6	0.0	0.999	0.010	0.010	59
July...						NIL.
August...						NIL.
September...						NIL.
October.....						NIL.
November (1-15)						NIL.
The period.....					0.25	1,322

## ROSS CREEK DRAINAGE BASIN

*General Description*

Ross Creek rises in Elkwater Lake, a small body of water covering an area of approximately two square miles, situated in Tp. 8, Rge. 3, W. 4th Mer. The creek flows in a northerly direction as far as Irvine and then turns sharply to the westward and closely parallels the main line of the Canadian Pacific Railway to Medicine Hat. Here it is joined by Sevenpersons River, and the combined flow empties into the South Saskatchewan in Sec. 32, Tp. 12, Rge. 5, W. 4th Mer. The tributaries of Ross Creek are Bullshead Creek, which joins it in Sec. 21, Tp. 12 Rge. 5, W. 4th Mer. and Grosventre Creek which joins it in Sec. 14, Tp. 11, Rge. 3, W. 4th Mer.

The topography of this basin is exceedingly rough and rolling and almost totally devoid of tree growth. The one exception is a small area of the Forest Reserve, just south of Elkwater Lake, which has a good stand of pine and spruce.

The Canadian Pacific Railway takes the water supply for its tank at Irvine from Ross Creek.

## ROSS CREEK AT ROBINSON'S RANCH.

This station was established on October 11, 1911, by M. H. French. It is located about 200 feet south of James Robinson's house, in the N. W.  $\frac{1}{4}$  Sec. 24, Tp. 9, Rge. 3, W. 4th Mer., and is about 30 miles southeast of Medicine Hat.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post sunk in the bed of the stream near the right bank eighteen feet above the cross-section. The zero of the gauge (elev. 93.00) is referred to a permanent iron bench mark (assumed elev. 100.00) seven feet from the initial point for soundings and in line with the regular cross-section.

The channel is straight for about 75 feet above and 50 feet below the station. Both banks are high enough to carry all stages of the stream. The bed of the stream is composed of very coarse gravel and will not shift. The fall of the stream at this point is very great. Water runs here all summer, but at the lowest stage the flow ceases a short distance below, owing to seepage and evaporation.

Discharge measurements are made at ordinary stages with a current meter by wading and at very low stages with a weir. The initial point for sounding is a five inch stake on the right bank 56 feet from the water's edge. It is painted red and is protected by a mound of stones. The final point for soundings is a stake on the left bank 103.2 feet from the initial point.

The gauge was read by James Robinson during 1912.

On August 25, the Canadian Pacific Railway Company opened a headgate at Elkwater Lake, turning a quantity of water into this creek. The records are affected, as shown, from August 28 to September 11. No water was diverted for irrigation or other purposes during 1912 above this station.



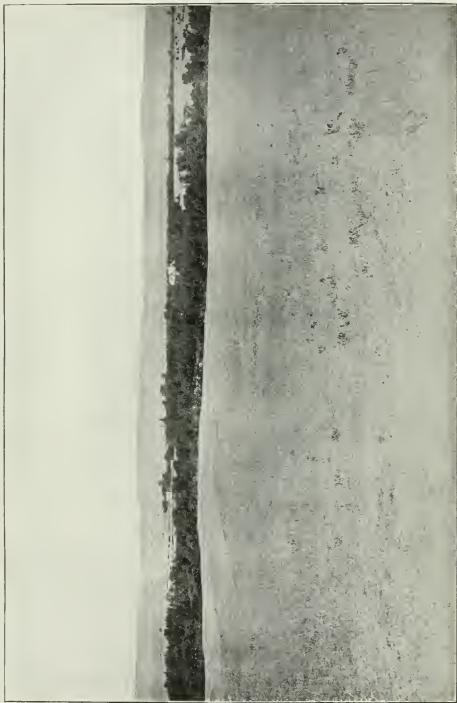
## DISCHARGE MEASUREMENTS of Ross Creek at Robinson's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 14 .....	G. R. Elliott.....	16.0	8.57	0.81	1.65	6.92
June 17.....	do .....	16.0	10.00	0.84	1.73	8.40
July 23.....	do .....	13.0	2.85	0.21	1.34	0.61
Aug. 23.....	do .....	12.0	2.60	0.13	1.27	0.35
Sept. 24.....	do .....	13.0	4.42	0.48	1.44	2.11
Oct. 29.....	do .....	12.2	4.25	0.44	1.42	1.88

## DAILY GAUGE-HEIGHT AND DISCHARGE of Ross Creek, at Robinson's Ranch, for 1912.

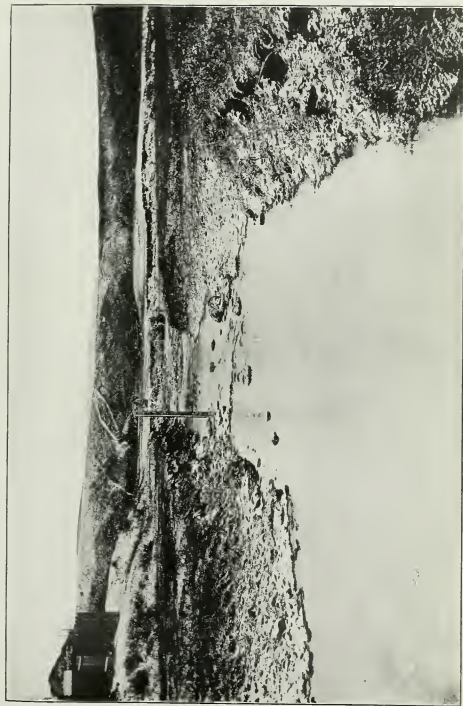
DAY.	May.		June.		July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.84	11.90	1.42	1.76	1.30	0.40
2.....			1.75	9.30	1.45	2.30	1.30	0.40
3.....			1.72	8.46	1.54	4.10	1.30	0.40
4.....			1.70	7.90	1.64	4.10	1.29	0.36
5.....			1.67	7.12	1.50	3.30	1.29	0.36
6.....			1.64	6.36	1.48	2.90	1.29	0.36
7.....			1.60	5.40	1.47	2.70	1.29	0.36
8.....			1.55	4.30	1.49	3.10	1.29	0.36
9.....			1.57	4.74	1.48	2.90	1.27	0.28
10.....			1.54	4.10	1.44	2.10	1.27	0.28
11.....			1.46	2.50	1.47	2.70	1.27	0.28
12.....			1.49	3.10	1.48	2.90	1.34	0.72
13.....			1.45	2.30	1.48	2.90	1.32	0.56
14.....	1.60	5.40	1.44	2.12	1.52	3.70	1.29	0.36
15.....	1.60	5.40	1.78	10.14	1.52	3.70	1.29	0.36
16.....	1.60	5.40	1.76	9.58	1.48	2.90	1.29	0.36
17.....	1.60	5.40	1.73	8.74	1.46	2.50	1.29	0.36
18.....	1.60	5.40	1.64	6.36	1.36	0.92	1.28	0.32
19.....	1.61	5.64	1.55	4.30	1.36	0.92	1.28	0.32
20.....	1.61	5.64	1.49	3.10	1.38	1.16	1.28	0.32
21.....	1.60	5.40	1.43	1.94	1.38	1.16	1.28	0.32
22.....	1.62	5.88	1.39	1.28	1.38	1.16	1.28	0.32
23.....	1.63	6.12	1.35	0.80	1.38	1.16	1.28	0.32
24.....	1.62	5.88	1.30	0.40	1.36	0.92	1.28	0.32
25.....	1.60	5.40	1.24	0.17	1.35	0.80	1.28	0.32
26.....	1.60	5.40	1.39	1.28	1.34	0.72	1.28	0.32
27.....	2.30	26.80	1.42	1.76	1.32	0.56	1.31	0.48
28.....	2.06	18.83	1.46	2.50	1.31	0.48	2.75	41.60 <sup>①</sup>
29.....	2.05	18.50	1.43	1.94	1.30	0.40	2.87	45.60
30.....	2.00	16.90	1.43	1.94	1.30	0.40	2.75	41.60
31.....	1.94	14.97	.....	.....	1.29	0.36	2.50	33.40

① C.P.R. used ditch to let water out of Elkwater Lake into Ross Creek.  
Discharges Aug. 28 to Sept. 11 affected.



Sarnia Ranch near Walsen, Alberta. Taken by G. R. Elliott.





Gauge on Ross Creek at Robinson's Ranch. Taken by G. R. Elliott.



## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Ross Creek, at Robinson's Ranch, for 1912

DAY.	September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1..	2.30	26.80	1.38	1.16	1.53	3.90
2..	2.30	26.80	1.36	1.92	1.42	1.76
3..	2.20	23.40	1.36	1.92	1.38	1.16
4..	2.00	16.90	1.38	1.16	1.38	1.16
5..	1.85	12.20	1.37	1.04	1.39	1.28
6..	1.60	5.40	1.38	1.16	1.42	1.76
7..	1.54	4.10	1.38	1.16	1.43	1.94
8..	1.46	2.50	1.38	1.16	1.41	1.58
9..	1.52	3.70	1.38	1.16	1.40	1.40
10..	1.46	2.50	1.40	1.40	1.38	1.16
11..	1.35	0.80	1.43	1.94	1.40	1.40
12..	1.30	0.40	1.47	2.70	1.42	1.76
13..	1.30	0.40	1.52	3.70	1.43	1.94
14..	1.32	0.56	1.49	3.10	1.43	1.94
15..	1.32	0.56	1.45	2.30	1.43	1.94
16..	1.34	0.72	1.43	1.94	.....	.....
17..	1.32	0.56	1.43	1.94	.....	.....
18..	1.32	0.56	1.46	2.50	.....	.....
19..	1.39	1.28	1.48	2.90	.....	.....
20..	1.44	2.12	1.48	2.90	.....	.....
21..	1.51	3.50	1.47	2.70	.....	.....
22..	1.48	2.90	1.46	2.50	.....	.....
23..	1.44	2.12	1.48	2.90	.....	.....
24..	1.43	1.94	1.46	2.50	.....	.....
25..	1.43	1.94	1.45	2.30	.....	.....
26..	1.43	1.94	1.43	1.94	.....	.....
27..	1.44	2.12	1.45	2.30	.....	.....
28..	1.44	2.12	1.47	2.70	.....	.....
29..	1.45	2.30	1.50	3.30	.....	.....
30..	1.41	1.58	1.55	4.30	.....	.....
31..	.....	.....	1.59	5.18	.....	.....

## MONTHLY DISCHARGE of Ross Creek at Robinson's Ranch, for 1912.

(Drainage area 36 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May (14-31).....	26.80	5.40	9.35	0.26	0.17	334
June.....	11.90	0.17	4.53	0.13	0.14	270
July.....	4.10	0.36	1.99	0.06	0.07	122
August.....	①45.60	0.28	5.55	0.15	0.17	⑤ 341
September.....	②26.80	0.40	5.16	0.14	0.16	④ 307
October.....	5.18	1.04	2.32	0.06	0.07	143
November (1-15).....	3.90	1.16	1.74	0.05	0.03	52
The period.....	.....	.....	.....	.....	0.81	1,569

① Affected by water turned in from Elkwater Lake by C. P. R. Ordinary maximum 0.72 sec.-ft.

② Affected by water turned in from Elkwater Lake by C. P. R. Ordinary maximum 3.50 sec.-ft.

③ Approx. 322 Acre-feet of this turned in by C. P. R.

④ Approx. 245 Acre-feet of this turned in by C. P. R.

## GROSVENTRE CREEK AT TOTHILL'S RANCH.

This station was established on October 10, 1911, by M. H. French. It is located beside Tothill's house in the S. E.  $\frac{1}{4}$  Sec. 27, Tp. 9, Rge. 4, W. 4th Mer., about 28 miles southeast of Medicine Hat.

The gauge, which is a plain staff graduated in feet and hundredths, is nailed to a post sunk in the bed of the stream near the right bank, 150 feet northwest of Tothill's house. The zero of the gauge (elev. 83.89) is referred to a permanent iron bench mark (assumed elev. 100.00) situated on the right bank.

The channel is straight for fifty feet above and 100 feet below the station. The right bank is very high and brush covered. The left bank is low and produces a wide channel at high stages. The bed of the stream is coarse gravel and is not liable to shift.

Discharge measurements are made during high stages with a current meter by wading, at a point about 18 feet downstream from the gauge. The initial point for soundings is the face of a four inch stake driven in the left bank against a large rock and marked "I.P." in knife cuts. At low stages gaugings are made with a weir, 88 feet downstream from the gauge.

During 1912, the gauge was read by Mrs. Kate Tothill.

#### DISCHARGE MEASUREMENTS of Grosventre Creek at Tothill's Farm, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 15 .....	G. R. Elliott.....	13.7	7.73	0.18	0.64	1.36
May 15 .....	do .....	13.5	7.17	0.16	0.64	1.14
June 17 .....	do .....	13.3	5.67	0.02	0.70	1.17
Oct. 29 .....	do .....	13.3	5.67	0.02	0.54	0.14

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Grosventre Creek, at Tothill's Farm, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1 .....			0.78	2.7	0.80	3.0	0.26	Nil. ①
2 .....			0.84	3.7	0.75	2.2	0.24	"
3 .....			0.89	4.8	0.69	1.38	0.24	"
4 .....	3.10	389	0.85	3.9	0.65	0.90	0.22	"
5 .....	2.23	116	0.90	5.0	0.64	0.80	0.19	"
6 .....	1.78	55	0.86	4.1	0.63	0.70	0.16	"
7 .....	1.86	64	0.88	4.6	0.58	0.29	0.17	"
8 .....	1.44	27	0.84	3.7	0.54	0.15	0.16	"
9 .....	2.00	80	0.77	2.5	0.52	0.12	0.16	"
10 .....	2.07	90	0.75	2.2	0.51	0.10	0.15	"
11 .....	2.00	80	0.70	1.50	0.46	0.05	0.16	"
12 .....	1.52	32	0.68	1.26	0.44	0.04	0.15	"
13 .....	1.20	14.5	0.65	0.90	0.38	0.02	0.14	"
14 .....	1.07	9.9	0.64	0.80	0.41	0.02	0.15	"
15 .....	1.00	7.7	0.64	0.80	0.70	1.50	0.11	"
16 .....	0.98	7.1	0.63	0.70	0.80	3.00	0.03	"
17 .....	0.98	7.1	0.60	0.40	0.72	1.78	Dry.	"
18 .....	0.96	6.6	0.58	0.29	0.63	0.70	"	"
19 .....	0.94	6.0	0.65	0.90	0.56	0.22	"	"
20 .....	0.90	5.0	0.64	0.80	0.52	0.12	"	"
21 .....								
22 .....	0.85	3.9	0.62	0.60	0.40	0.02	"	"
23 .....	0.84	3.7	0.62	0.60	0.33	0.01	"	"
24 .....	0.86	4.1	0.65	0.90	0.28	Nil. ②	"	"
25 .....	0.84	3.7	0.68	1.26	0.25	"	"	"
26 .....	0.83	3.5	0.64	0.80	0.22	"	"	"
27 .....								
28 .....	0.82	3.4	0.63	0.70	0.26	"	"	"
29 .....	0.85	3.9	1.30	19.0	0.24	"	"	"
30 .....	0.80	3.0	1.48	29	0.23	"	"	"
31 .....	0.81	3.2	1.10	10.8	0.24	"	"	"
32 .....	0.86	4.1	0.98	7.1	0.25	"	"	"
33 .....			0.90	5.0			"	"

① Discharges for April approximate, depending upon slope measurement at G.H. 5.00.

② Water standing in pools.

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Grosventre Creek at Tothill's Farm, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	Dry.	NIL. ①	Dry.	NIL. ①	Dry.	NIL. ①	0.52	0.12
2.....	"	"	"	"	"	"	0.53	0.13
3.....	"	"	"	"	"	"	0.52	0.12
4.....	"	"	"	"	"	"	0.55	0.17
5.....	"	"	"	"	"	"	0.56	0.22
6.....	"	"	"	"	"	"	0.57	0.26
7.....	"	"	"	"	"	"	0.55	0.17
8.....	"	"	"	"	"	"	0.56	0.22
9.....	"	"	"	"	"	"	0.56	0.22
10.....	"	"	"	"	"	"	0.58	0.31
11.....	"	"	"	"	0.55	0.17	0.61	0.50
12.....	"	"	"	"	0.56	0.22	0.54	0.15
13.....	"	"	"	"	0.55	0.17	0.56	0.22
14.....	"	"	"	"	0.51	0.10	0.57	0.26
15.....	"	"	"	"	0.50	0.08		
16.....	"	"	"	"	0.46	0.05		
17.....	"	"	"	"	0.56	0.22		
18.....	"	"	"	"	0.56	0.22		
19.....	"	"	"	"	0.57	0.26		
20.....	"	"	"	"	0.62	0.60		
21.....	"	"	"	"	0.58	0.31		
22.....	"	"	"	"	0.58	0.31		
23.....	"	"	"	"	0.55	0.17		
24.....	"	"	"	"	0.58	0.31		
25.....	"	"	"	"	0.54	0.15		
26.....	"	"	"	"	0.52	0.12		
27.....	"	"	"	"	0.53	0.13		
28.....	"	"	"	"	0.54	0.15		
29.....	"	"	"	"	0.54	0.15		
30.....	"	"	"	"	0.56	0.22		
31.....	"	"	"	"	0.54	0.15		

① Water standing in pools.

## MONTHLY DISCHARGE of Grosventre Creek at Tothill's Farm, for 1912.

(Drainage area 16 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (4-30).....	389	3.0	38.3	2.40	2.41	2,051 ①
May.....	29	0.29	3.91	0.244	0.28	240
June.....	3.0	0.00	0.571	0.036	0.04	34
July.....						NIL.
August.....						NIL.
September.....						NIL.
October.....	0.60	0.00	0.137	0.009	0.01	8
November (1-14).....	0.50	0.00	0.219	0.014	0.007	6
The period.....					2.75	2,339

① Run-off for April approximate, depending upon slope measurements.

## ROSS CREEK AT IRVINE.

This station was established on July 28, 1909, by F. T. Fletcher. It is located at the traffic bridge in the town of Irvine, on Sec. 31, Tp. 11, Rge. 2, W. 4th Mer., about 400 yards below the Canadian Pacific Railway Company's dam.



The gauge, which is a plain staff graduated to feet and hundredths, is spiked to the downstream pile of the second row from the left abutment. The zero of the gauge (elev. 77.355) is referred to a permanent iron bench mark (assume elev. 100.00), located on the left bank of the creek 66.5 feet east of the end of the upstream handrail.

The stream flows in one channel, which is slightly curved for 75 feet above the station and almost straight for 600 feet below. The banks are composed of clay, and are high and not liable to overflow. The bed is composed of sand and gravel and may shift at high stages.

Discharge measurements are made from the downstream side of the bridge during high stages of the stream, and during low water it is waded. During extreme low water a weir is used.

During 1912, the gauge was read by H. G. Price.

#### DISCHARGE MEASUREMENTS of Ross Creek at Irvine, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 16	D. D. MacLeod.....	19	27.8	1.50	2.30	41.19
May 1	do .....	16.5	17.06	0.94	1.60	16.10
May 17	do .....	15	11.7	0.57	1.29	6.65
June 18	H. D. St. A. Smith.....	13	10.48	0.932	1.25	9.68
July 4	do .....	①			0.77	0.076
July 18	do .....	①			0.78	0.236
Aug. 6	do .....	①			0.74	0.130
Sept. 5	do .....	18	17.10	1.04	1.57	17.7
Sept. 19	do .....	6	2.05	0.12	0.77	0.24
Oct. 15	do .....	6	2.55	1.11	0.98	2.83
Oct. 31	do .....	6	2.05	0.74	0.84	1.58

① Weir measurement.

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Ross Creek at Irvine, for 1912.

DAY.	February.		March.		April.		May.		June.		July.	
	Gauge Height.		Gauge Height.		Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1							1.66	17.9	3.00	58	0.76	0.25
2							1.65	17.6	2.50	44	0.76	0.25
3							1.79	22	2.00	30	0.77	0.36
4					8.04	283	1.80	22	1.70	22	0.77	0.36
5					8.00	281	1.76	21	1.50	15.9	0.77	0.36
6					5.99	197	1.73	20	1.25	9.4	0.77	0.36
7					5.50	177	1.70	19.2	1.23	8.9	0.77	0.36
8					5.90	193	1.68	18.6	1.20	8.2	0.77	0.36
9					5.80	189	1.64	17.3	1.16	7.3	0.77	0.36
10					5.70	185	1.62	16.6	1.12	6.4	0.77	0.36
11					5.60	181	1.60	16	1.10	6.0	0.77	0.36
12					5.00	156	1.55	14.4	1.09	5.8	0.77	0.36
13					4.60	139	1.48	12.2	1.10	6.0	0.78	0.48
14					3.80	105	1.40	9.8	1.12	6.4	0.78	0.48
15					3.00	71	1.37	9.0	1.20	8.2	0.78	0.48
16	① 1.20				2.30	41	1.33	7.8	1.30	10.7	0.78	0.48
17	2.30				2.21	38	1.31	7.3	1.35	12.0	0.78	0.48
18	2.25				2.10	33	1.29	6.7	1.25	9.4	0.78	0.48
19	2.28				2.00	30	1.27	6.2	1.02	4.2	0.78	0.48
20	2.45				1.91	26	1.25	5.6	0.92	2.3	0.78	0.48
21	2.70				1.87	25	1.27	6.2	0.86	1.44	0.78	0.48
22	2.65		② 2.01		1.84	24	1.28	6.4	0.81	0.82	0.78	0.48
23	2.56		2.08		1.81	23	1.30	7.0	0.78	0.48	0.79	0.50
24	2.51		2.95		1.80	22	1.30	7.0	0.75	0.14	0.78	0.48
25	2.49		8.88		1.80	22	1.30	7.0	0.74	0.13	0.78	0.48
26	2.00		9.01		1.77	22	1.30	7.0	0.73	0.12	0.78	0.48
27			10.02		1.72	20	1.10	8.9	0.70	0.10	0.78	0.48
28			③		1.70	19.2	4.00	86.0	0.69	0.10	0.78	0.48
29					1.68	18.5	3.70	78.0	0.69	0.10	0.78	0.48
30					1.67	18.2	3.50	72.0	0.69	0.10	0.78	0.48
31							3.30	66.0			0.77	0.36

① Water running on ice from Feb. 16 to 26 and from March 22 to 27.

② Water over top of gauge March 28 to April 3 and ice running at same time.

③ Heavy rain.

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Ross Creek at Irvine, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	0.77	0.364	2.40	41.	0.70	0.10	0.84	1.18
2.	0.77	0.364	2.30	38	0.70	0.10	0.82	0.94
3.	0.77	0.364	2.20	36	0.70	0.10	0.82	0.94
4.	0.77	0.364	1.90	27	0.70	0.10	0.81	0.82
5.	0.77	0.364	1.57	17.9	0.70	0.10	0.81	0.82
6.	0.77	0.364	1.55	17.20	0.70	0.10	0.79	0.588
7.	0.77	0.364	1.40	13.20	0.70	0.10	0.79	0.588
8.	0.77	0.364	1.30	10.70	0.70	0.10	0.77	0.364
9.	0.77	0.364	1.20	8.20	0.75	0.140	0.76	0.252
10.	0.77	0.364	1.10	6.00	1.02	4.25	0.75	0.140
11.	0.77	0.364	1.00	3.81	1.00	3.81	0.74	0.132
12.	0.77	0.364	0.90	2.00	0.95	2.80	0.72	0.116
13.	0.77	0.364	0.85	1.30	0.95	2.80	0.71	0.108
14.	0.77	0.364	0.77	0.364	0.95	2.80	0.70	0.10
15.	0.77	0.364	0.75	0.140	0.95	2.80	0.70	0.10
16.	0.77	0.364	0.73	0.124	0.95	2.80	0.70	0.10
17.	0.77	0.364	0.70	0.10	0.93	2.48		
18.	0.77	0.364	0.70	0.10	0.93	2.48		
19.	0.77	0.364	0.70	0.10	0.90	2.00		
20.	0.77	0.364	0.70	0.10	0.90	2.00		
21.	0.77	0.364	0.70	0.10	0.89	1.86		
22.	0.76	0.252	0.70	0.10	0.87	1.58		
23.	0.76	0.252	0.70	0.10	0.86	1.44		
24.	0.76	0.252	0.70	0.10	0.86	1.44		
25.	0.76	0.252	0.70	0.10	0.86	1.44		
26.	0.76	0.252	0.70	0.10	0.85	1.30		
27.	0.76	0.252	0.70	0.10	0.85	1.30		
28.	0.76	0.252	0.70	0.10	0.84	1.18		
29.	0.76	0.252	0.70	0.10	0.84	1.18		
30.	3.00	58	0.70	0.10	0.84	1.18		
31.	2.50	44			0.84	1.18		

## MONTHLY DISCHARGE of Ross Creek at Irvine, for 1912.

(Drainage area 248 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (4-30).....	283	18.2	94.03	0.379	0.38	5,060
May.....	89	6.2	23.19	0.093	0.11	1,426
June.....	58	0.1	9.49	0.038	0.04	565
July.....	0.59	0.25	0.426	0.002	0.002	26
August.....	58	0.25	3.6	0.014	0.02	221
September.....	41	0.1	7.48	0.030	0.03	445
October.....	4.25	0.1	1.52	0.006	0.01	93
November (1-16).....	1.18	0.1	.456	0.002	0.001	14
The period.....					0.593	7,840

## BULLSHED CREEK AT CLARK'S RANCH.

This station was established on October 9, 1911, by M. H. French. It is located at Clark's house in the N. W.  $\frac{1}{4}$  Sec. 16, Tp. 9, Rge. 5, W 4th Mer., about 25 miles south of Medicine Hat.

The gauge, which is a plain staff graduated in feet and hundredths, is nailed to a post sunk in the bed of the stream near the left bank. The zero of the gauge (elev. 88.45) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the left bank, 130 feet from Clark's house and midway between the gauge and initial point for soundings, 65 feet from each.

The channel is curved for 100 feet above and straight for 200 feet below the gauge. Both banks are grassy and high and will not overflow. The bed is coarse gravel and is not liable to shift.

Discharge measurements at high stages are made with a current meter by wading. The initial point for soundings is the face of a four-inch stake driven in the left bank, 113 feet downstream from the gauge and marked "I.P.", in knife cuts. At low stages measurements are made with a weir, 300 feet downstream.

During 1912, the gauge was read by Mrs. Ed. Clark.

The headgate of Mrs. Clark's irrigation ditch is about a mile above this station. No water was diverted during 1912.

#### DISCHARGE MEASUREMENTS of Bullshead Creek at Clark's Ranch, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 15 . . . . .	G. R. Elliott . . . . .				1 20	1.74
June 18 . . . . .	do . . . . .	17 0	8 53	0 89	1 09	0 76
July 24 . . . . .	do . . . . .				0 90	Nil. ①
Sept. 24 . . . . .	do . . . . .	17 0	8 88	0 05	1 11	0 42
Sept. 30 . . . . .	do . . . . .	17 0	8 57	0 04	1 09	0 33
Oct. 30 . . . . .	do . . . . .	19 0	14 79	0 04	1 17	0 60
Oct. 30 . . . . .	do . . . . .	19 0	14 59	0 04	1 16	0 53

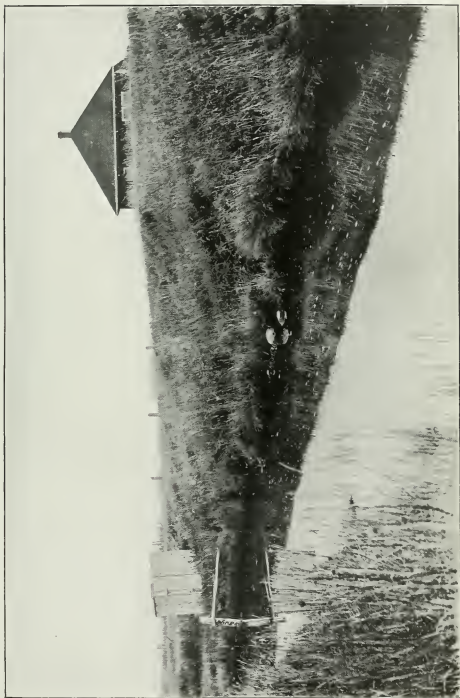
① Water standing in pools.

#### DAILY GAUGE-HEIGHT AND DISCHARGE of Bullshead Creek at Clark's Ranch, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1 . . . . .	3.09	154	1 42	5.5	1.03	0.40	0.98	0.19
2 . . . . .	4.39	463	1 42	5.5	1.13	1.06	1.05	0.50
3 . . . . .	4.88	621	1 42	5.5	1.25	2.4	1.00	0.25
4 . . . . .	4.20	406	1 42	5.5	1.20	1.75	0.96	0.13
5 . . . . .	3.58	245	1 42	5.5	1.20	1.75	0.96	0.13
6 . . . . .	2.63	89	1 43	5.7	1.20	1.75	0.95	0.10
7 . . . . .	3.03	145	1 42	5.7	1.20	1.75	0.95	0.10
8 . . . . .	3.03	145	1 42	5.7	1.08	0.69	0.96	0.13
9 . . . . .	2.61	86	1 42	5.7	1.00	0.25	0.98	0.19
10 . . . . .	3.57	264	1 42	5.7	1.00	0.25	0.98	0.19
11 . . . . .	2.61	86	1 42	5.7	1.00	0.25	1.01	0.30
12 . . . . .	2.54	78	1 42	5.7	1.00	0.25	1.02	0.35
13 . . . . .	1.54	8.9	1 42	5.7	1.00	0.25	0.98	0.19
14 . . . . .	1.53	8.6	1.32	3 49	1.05	0.50	1.05	0.50
15 . . . . .	1.53	8.6	1.20	1.75	1.19	1.65	1.04	0.45
16 . . . . .	1.53	8.6	1.18	1.54	1.12	0.98	1 00	0.25
17 . . . . .	1.55	9.2	1.18	1.54	1.10	0 82	0.96	0.13
18 . . . . .	1.54	8.9	1.16	1.32	1.10	0 82	0.94	0.08
19 . . . . .	1.54	8 9	1.16	1.32	1.10	0 82	0.92	0.04
20 . . . . .	1.54	8 9	1.16	1 32	1.10	0 82	0.92	0.04
21 . . . . .	1.53	8.6	1.16	1.32	1.00	0.25	0.91	0.02
22 . . . . .	1.53	8.6	1.16	1.32	1.00	0.25	0.90	Nil.
23 . . . . .	1.53	8.6	1.18	1.54	1.00	0.25	0.90	"
24 . . . . .	1.53	8.6	1.18	1.54	0.95	0.10	0.90	"
25 . . . . .	1.53	8 6	1.16	1 32	0.90	0.00	0.94	0.08
26 . . . . .	1.53	8 6	1.16	1.32	0.90	0.00	0.90	Nil. ①
27 . . . . .	1.53	8 6	1.97	29	0 90	0 00	0.90	"
28 . . . . .	1.42	5.5	1.54	8 9	0 90	0 00	0.90	"
29 . . . . .	1 42	5 5	1.31	3 3	0 90	0 00	0 90	"
30 . . . . .	1 53	8 6	1.01	0 30	0 91	0 02	0 90	"
31 . . . . .			1.03	0 40			0 90	"

① Daily discharge April 1 to May 14 approximate depending upon slope measurement at G. H. 5.0.

② Water standing in pools.



Gauge on Bullishead Creek at Clark's Ranch. Taken by G. R. Elliott.



## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Bullshead Creek at Clark's Ranch, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.90	Nil <sup>①</sup>	.....	Nil <sup>①</sup>	1.08	0.32	1.09	0.36
2.....	0.90	"	.....	"	1.08	0.32	1.08	0.32
3.....	0.90	"	.....	"	1.08	0.32	1.16	0.62
4.....	0.90	"	.....	"	1.10	0.39	1.10	0.39
5.....	0.90	"	.....	"	1.11	0.42	1.07	0.29
6.....	"	"	.....	"	1.11	0.42	1.08	0.32
7.....	"	"	.....	"	1.10	0.39	1.08	0.32
8.....	"	"	1.05	0.23	1.08	0.32	1.12	0.46
9.....	"	"	1.21	0.90	0.18	0.71	1.16	0.62
10.....	"	"	1.10	0.39	1.21	0.90	1.16	0.62
11.....	"	"	1.05	0.23	1.21	0.90	1.14	0.53
12.....	"	"	1.05	0.23	1.16	0.62	1.15	0.57
13.....	"	"	1.06	0.26	1.16	0.62	1.15	0.57
14.....	"	"	1.06	0.26	1.16	0.62	1.15	0.57
15.....	"	"	1.06	0.26	1.15	0.57	1.15	0.57
16.....	"	"	1.06	0.26	1.15	0.57	.....	.....
17.....	"	"	1.06	0.26	1.14	0.53	.....	.....
18.....	"	"	1.06	0.26	1.14	0.53	.....	.....
19.....	"	"	1.12	0.46	1.15	0.57	.....	.....
20.....	"	"	1.15	0.57	1.15	0.57	.....	.....
21.....	"	"	1.10	0.39	1.12	0.46	.....	.....
22.....	"	"	1.12	0.46	1.15	0.57	.....	.....
23.....	"	"	1.14	0.53	1.15	0.57	.....	.....
24.....	"	"	1.12	0.46	1.15	0.57	.....	.....
25.....	"	"	1.10	0.39	1.15	0.57	.....	.....
26.....	"	"	1.10	0.39	1.15	0.57	.....	.....
27.....	"	"	1.12	0.46	1.15	0.57	.....	.....
28.....	"	"	1.12	0.46	1.15	0.57	.....	.....
29.....	"	"	1.10	0.39	1.16	0.62	.....	.....
30.....	"	"	1.09	0.36	1.18	0.71	.....	.....
31.....	"	"	.....	.....	1.10	0.39	.....	.....

① Water standing in pools.

## MONTHLY DISCHARGE of Bullshead Creek at Clark's Ranch, for 1912.

(Drainage area 53 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	① 621	5.5	97.7	1.84	2.05	5,814
May.....	① 29	0.30	4.38	0.083	0.10	269
June.....	2.4	Nil.	0.669	0.013	0.01	40
July.....	0.5	Nil.	0.140	0.003	0.004	9
August.....	②	.....	.....	.....	.....	Nil.
September.....	0.9	Nil.	0.295	0.006	0.007	18
October.....	0.9	0.32	0.541	0.010	0.01	33
November (1-15).....	0.62	0.29	0.475	0.009	0.005	14
December.....	.....	.....	.....	.....	.....	.....
The period.....	.....	.....	.....	.....	2.18	6,197

① Run off approximate and is based on a slope measurement at gauge height 5.00.

② No flow during the month.

## STARKS AND BURTON DITCH NEAR WOOLCHESTER.

This station was established on October 9, 1911, by W. A. Fletcher. It is located on the S. E.  $\frac{1}{4}$  Sec. 17, Tp. 11, Rge. 5, W. 4th Mer., about 260 feet below the headgate of the ditch and ten miles south of Medicine Hat.

The gauge, which is a plain staff graduated to feet and inches, is nailed to a post at the right bank. The zero of the gauge (elev. 97.87) is referred to the top of a stake (assumed elev. 100.00), in the right bank and six feet upstream from the gauge.

The channel is straight for 250 feet above and 50 feet below the gauge. The cross section is uniform and the bed and banks are sandy.

Discharge measurements during high water are made with a current meter by wading. The initial point for soundings is the top of the bench mark. Ordinary discharges are measured with a weir.

Daily gauge heights were not obtained during 1912. The ditch flowed for about 36 days from May 15 to June 20, and had an approximate discharge of 0.5 cu. ft. per sec.

## BULLSHEAD CREEK NEAR DUNMORE.

This station was established July 26, 1909, by F. T. Fletcher. It is located at the traffic bridge on the S. W.  $\frac{1}{4}$  Sec. 16, Tp. 12, Rge. 5, W. 4th Mer. It is four miles from Medicine Hat, and one mile above the junction of Ross and Bullshead Creeks.

The gauge, which is a plain staff graduated to feet and hundredths, is spiked to the upstream side of the left abutment. The zero of the gauge (elev. 89.48) is referred to a permanent iron bench mark (assumed elev. 100.00), located 15 feet south of the left abutment of bridge.

The stream flows in one channel, which is straight for about 200 feet above and 450 feet below the station. The banks are high, clean and not liable to overflow. The bed is composed of sand and shifts.

During high water discharge measurements are made from the bridge, but during low water the discharge is measured by wading, or by means of a weir.

A competent observer could not be secured during 1912, and there are therefore no records of the daily discharge.

## DISCHARGE MEASUREMENTS of Bullshead Creek near Dunmore, in 1912.

Date.	Hydrographer.	Width.	Area. of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 15. ....	D. D. MacLeod. ....	34.5	48.8	1.34	2.24	65.2
May 4. ....	do .....	28.5	19.1	0.50	1.62	9.5
May 30. ....	do .....	31.5	25.5	0.94	1.83	24.0
June 14. ....	H. D. St. A. Smith. ....			① .....	1.12	0.28
July 5. ....	do .....			① .....	1.02	1.26
July 19. ....	do .....			① .....	1.00	0.35
Aug. 1. ....	do .....					Nil
Aug. 20. ....	do .....			① .....	0.04	0.15
Sept. 5. ....	do .....	6.	1.9	0.127	1.00	0.24
Sept. 17. ....	do .....			① .....	0.96	0.24
Oct. 3. ....	do .....			① .....	0.96	0.21
Oct. 16. ....	do .....			① .....	1.00	0.28

① Weir measurement.

## SEVENPERSONS RIVER DRAINAGE BASIN.

*General Description.*

Sevenpersons River lies between the South Saskatchewan River and the Cypress Hills and empties into the South Saskatchewan River at Medicine Hat. The catchment area consists almost entirely of open, level prairie with a small rainfall and very little run-off. During the early spring freshets and after very heavy rains there is a good flow for a few days, but at other times the stream is either dry or almost dry.

The soil is good and dry farming is carried on quite successfully, but owing to the limited water supply, irrigation is not likely to be attempted.

Records on this stream are taken for general statistical purposes.

## SEVENPERSONS RIVER AT MEDICINE HAT.

This station was established on April 27, 1910, by H. R. Carscallen. It is located in the N. E.  $\frac{1}{4}$  Sec. 30, Tp. 12, Rge. 5, W. 4th Mer., at the bridge on the road from Medicine Hat to Dunmore Junction and about one and a half mile east of the Canadian Pacific Railway station at Medicine Hat.

The gauge, which is a plain staff graduated to feet and hundredths, is attached to the east, or right abutment of the bridge. The zero of the gauge (elev. 86.68) is referred to a permanent iron bench mark (assumed elev. 100.00), located 100 feet north of mound and 64 feet from the left abutment.

The channel is straight for about 100 feet above and below the station. Both banks are high and wooded. The stream bed is sandy and liable to change at high water.

During high water stages, discharge measurements are made with a current meter. The initial point of soundings is the inner face of the left abutment of the bridge. Low water measurements are made with a weir.

During 1912, the gauge was read by W. B. Dempster.

## DISCHARGE MEASUREMENTS of Sevenpersons River at Medicine Hat, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 12.....	D. D. MacLeod.....	54	187 00	3.10	4.60	579.48
May 4.....	do .....	15 7	11 50	1.97	1 58	22.64
May 17.....	do .....	11 0	5.09	1.31	1 24	6.66
June 15.....	H. D. St. A. Smith.....	7	3.30	0.897	0 99	2.96
July 5.....	do .....	① .....	.....	.....	0 90	0.31
Aug. 1.....	do .....	② .....	.....	.....	.....	Nil.
Aug. 20.....	do .....	③ .....	.....	.....	.....	Nil.
Sept. 5.....	do .....	10.	5.00	0.138	1 07	0.69
Sept. 17.....	do .....	10	5.15	0.129	1 16	0 67
Oct. 3.....	do .....	10	5.50	0.135	1.10	0.75
Oct. 16.....	do .....	11.	5.40	0.140	1.14	0.76

① Weir measurement.

② Creek dry.



## DAILY GAUGE-HEIGHT AND DISCHARGE of Sevenpersons River at Medicine Hat, for 1912.

DAY.	July.		August.		September.		October.		November.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....				③			1 30	1 12	1 25	1 00
2.....			1 26	6 8			1 23	0 95	1 25	1 00
3.....			1 29	7 9		④	1 23	0 95	1 25	1 00
4.....			1 29	7 9	1 12	0 68	1 23	0 95	1 25	1 00
5.....			1 26	6 8	1 07	0 55	1 23	0 95	1 25	1 00
6.....			1 25	6 5	1 13	0 70	1 23	0 95	1 25	1 00
7.....			1 15	4 0	1 12	0 68	1 01	0 42	1 25	1 00
8.....			1 14	3 7	1 12	0 68	1 13	0 70	1 25	1 00
9.....				③	1 18	0 82	1 50	1 62	1 25	1 00
10.....					1 15	0 75	1 65	2 00	1 25	1 00
11.....					1 13	0 70	1 58	1 82	1 25	1 00
12.....					1 11	0 65	1 53	1 70	1 25	1 00
13.....					1 00	0 40	1 48	1 57	1 25	1 00
14.....					1 00	0 40	1 41	1 40	1 25	1 00
15.....					1 14	0 72	1 39	1 35	1 25	1 00
16.....					1 14	0 72	1 33	1 20		
17.....					1 16	0 78	1 29	1 10		
18.....					1 17	0 80	1 28	1 08		
19.....					1 18	0 82	1 28	1 08		
20.....		①			1 19	0 85	1 25	1 00		
21.....	1 26	6 8			1 19	0 85	1 25	1 00		
22.....	1 37	10 8			1 51	1 65	1 26	1 02		
23.....	1 20	5 2			1 65	2 0	1 25	1 00		
24.....		④			1 73	2 2	1 25	1 00		
25.....					2 00	3 2	1 25	1 00		
26.....					2 19	3 8	1 25	1 00		
27.....					2 26	4 1	1 25	1 00		
28.....					2 35	4 5	1 25	1 00		
29.....					2 13	3 6	1 25	1 00		
30.....					1 50	1 6	1 25	1 00		
31.....							1 25	1 00		

① No regular observer until July 21.

② Creek dry from August 8 to September 3, and from July 23 to August 2.

## MONTHLY DISCHARGE of Sevenpersons River at Medicine Hat, for 1912.

(Drainage area 442 square miles.)

MONTH.	DISCHARGE IN SECOND-FT.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
July (21-31).....	10 8	NIL	2 07	0 005	0 002	45
August.....	7 9	NIL	1 41	0 003	0 004	86
September.....	4 5	NIL	1 37	0 003	0 003	82
October.....	2 0	0 42	1 13	0 003	0 002	69
November (1-15).....	1 0	1 00	1 00	0 002	0 001	30
The period.....					0 012	312

## LAKE JOHNSTON DRAINAGE BASIN.

*General Description.*

Lake Johnston lies about twenty miles southwest of the city of Moose Jaw. It is about twenty-five miles long and fifteen wide and covers an area of nearly five townships. Almost all the drainage into the lake comes from the south and west through Wood River. The main tributaries of Wood River and Wiwa Creek, Notukeu Creek, Pinto Creek and Wood Creek. These drain a large area, but, owing to the limited rainfall and the small slope of the drainage basin, the run-off is comparatively small.

Lake Johnston has no surface outlet and there has been no surface flow from Lake Chaplin to Lake Johnston for several years, but it will be noted that the elevations of the two lakes are the same. There is often considerable flow in Wood River in the spring and there is always some discharge, but the lake has, during recent years, receded.

The lower part of Wood River has a very small fall and is more of the nature of a long slough than a running stream. The channel is from twenty to fifty feet wide and from two to five feet deep. The bottom is composed of soft clay and is covered with weeds and grass. There is so little fall that it would be impossible to take out water by gravity and a dam would flood a large area of good agricultural land. There is, therefore, little possibility of irrigation development in this basin.

This drainage basin includes a large area of very good agricultural land. This is pretty well taken up by settlers and is being farmed with good results. There is one irrigation scheme on Pearce Creek.

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Lake Johnston, Drainage Basin Sask., in 1912.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq.-feet.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
June 18.....	P. J. Jennings .	Pearce Creek. . .	18-10-13-3.....	①.....	.....	.....	1.18

① Gauging made with 18 inch weir.

## ROCKY CREEK DRAINAGE BASIN.

*General Description.*

Rocky Creek lies between the Frenchman River and Poplar River. With its many tributaries it drains the southwestern slope of Wood Mountain. The main stream has its source in Tp. 3, Rge. 5, W. 3rd Mer., and, crossing the international boundary near the southwest corner of Sec. 2, Tp. 1, Rge. 6, W. 3rd Mer., eventually finds its way into Milk River near Hinsdale, Montana. There is only a small portion of the drainage basin of this stream in Canada.

Due possibly to the elevation, the precipitation in the upper part of this basin is a little above the average for the surrounding prairie. All the streams in the basin have a good flow during the spring freshet period, but soon recede and most of the time they are all dry or have only water in pools, except the main stream which generally has at least a small flow at all seasons. The upper portion of the drainage basin consists of rolling prairie land very much cut up by coulees and ravines. There are small areas of heavy gumbo land, but for the most part the soil is good and productive, and that portion of the drainage basin lying in Canada is quite suitable for ranching or mixed farming.

Owing to the rolling nature of the land and the limited water supply, irrigation can be developed but little in this basin.

## POPLAR RIVER DRAINAGE BASIN.

*General Description.*

Poplar River rises in Tp. 3, Rge. 3, W. 3rd Mer., and, with its many tributaries, drains the southeastern slope of Wood Mountain. The main stream crosses the international boundary near the southwest corner of Sec. 1, Tp. 1, Rge. 29, W. 2nd Mer., and empties into Missouri River near Poplar, Montana. There is only a small portion of the drainage basin of this stream in Canada.

Due possibly to the elevation, the precipitation in the upper part of this basin is a little above the average for the surrounding prairie. All the streams in the basin have a good flow during the spring freshet period but soon recede, and most of the time they have only a very small flow.

In the lower part of the basin the fall in the main stream is very small. The channel is from thirty to seventy-five feet wide and from two to three feet deep. The current is sluggish and the channel is full of weeds. The banks of the stream are low and liable to overflow at the time of the spring freshet.

The upper portion of the drainage basin consists of rolling prairie and that portion lying in Canada is quite suitable for ranching or mixed farming. Irrigation development will be limited by the water supply.

## BIGMUDDY CREEK DRAINAGE BASIN.

*General Description.*

Bigmuddy Creek has no well defined course in Canada, but develops from a depression running southeast from Bigmuddy Lake, and after crossing the international boundary flows southward and empties into Missouri River near Cuthbertson, Montana.

The source of Beaver Creek, a tributary of Bigmuddy Creek, is in Canada, but it, too, is a small and unimportant stream.

That portion of the drainage basin lying in Canada consists of alkali flats, and rough rolling prairie. It is quite suitable for ranching purposes.

## QU'APPELLE RIVER DRAINAGE BASIN.

*General Description.*

Qu'Appelle River rises in Tp. 23, Rge. 4, W. 3rd Mer., and flows eastward into the Assiniboine River in Tp. 28, Rge. 17, W. Principal Meridian. These waters eventually find their way into Hudson's bay through the Red River, Lake Winnipeg and Nelson River.

The chief tributaries of Qu'Appelle River are Moose Jaw Creek, Last Mountain Lake, Wascanna Creek and Loon Creek. Last Mountain is the largest lake in the basin, being some sixty miles long and from one to three miles wide.

The valley of the main stream is from two to three hundred feet deep, with a flat from one to three miles wide along the river. This flat is covered in many places with brush and the side hills are in many places well wooded. The bench lands above the river are mostly level prairie, much of which is now under cultivation.

The mean annual rainfall at Moose Jaw is fourteen inches, at Regina fifteen inches, and at Indian Head nineteen inches. The streams are frozen during the winter months and there is usually an abundant snow fall.

There are several irrigation and many industrial water rights in this basin.

## QU'APPELLE RIVER AT LUMSDEN.

This station was established on May 12, 1911, by J. C. Keith. It is located at a private bridge on the premises of Mr. Jas. McEwen, on the N.W.  $\frac{1}{4}$  Sec. 33, Tp. 19, Rge. 21, W. 2nd Mer., in the north end of the town of Lumsden and is about three miles below the mouth of Wascanna Creek and a little over one mile above the mouth of Boggy Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is fastened to the downstream side of the left abutment of the bridge. The zero of the gauge (elev. 85.33) is referred to a permanent iron bench mark (assumed elev. 100.00), located on the right bank of the river, 34 feet from the southeast corner of the bridge.

The channel is straight for 200 feet above and below the station. Both banks are fairly high but are liable to overflow in an excessive flood. The bed of the stream is composed of gravel and is not likely to shift. The current is moderate.

Discharge measurements are made from the bridge at all stages. The initial point for soundings is the inner face of the left abutment of the bridge.

The gauge was read during 1911 by R. T. Raven, and during 1912 by R. T. Raven, A. S. Taylor and Jas. McEwen.

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## DISCHARGE MEASUREMENTS of Qu'Appelle River at Lumsden, in 1911-12.

Date.	Hydrographer.	Width.	Area. of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
April 17.....	W. H. Greene.....	45.5	292.84	1.83	.....	537.00
May 12.....	J. C. Keith.....	27.0	101.50	0.643	3.06	65.48
May 27.....	do.....	25.0	96.40	0.71	3.12	68.54
June 15.....	do.....	27.0	117.00	1.00	3.82	117.91
July 11.....	do.....	25.0	79.01	0.37	2.50	28.92
Aug. 18.....	do.....	24.0	66.36	0.20	2.00	13.41
Oct. 6.....	do.....	24.0	67.53	0.21	2.07	17.30
Dec. 1.....	do.....	.....	6.60	0.47	1.98	3.11
1912.						
Jan. 19.....	J. C. Keith.....	①	.....	.....	1.34	0.05
Feb. 12.....	do.....	②	.....	.....	1.35	0.206
April 27.....	D. D. MacLeod.....	27.0	131.40	1.04	4.30	136.17
May 13.....	do.....	47.5	330.87	1.86	9.65	615.14
May 25.....	do.....	44	232.50	1.74	7.72	403.47
June 29.....	H. D. St. A. Smith.....	27	137.31	0.60	3.965	82.26
July 15.....	do.....	27	138.10	0.58	3.575	80.21
July 31.....	do.....	27	124.00	0.43	3.12	53.60
Aug. 17.....	do.....	27	108.03	0.26	2.50	27.81
Sept. 7.....	do.....	27	110.50	0.19	2.58	21.30
Sept. 16.....	do.....	27	108.96	0.25	2.50	27.04
Sept. 30.....	do.....	27	97.38	0.19	2.49	18.20
Oct. 29.....	do.....	27	94.80	0.18	2.30	17.90
Nov. 14.....	do.....	27	119.00	0.37	2.80	44.00
Nov. 23.....	do.....	27	112.80	0.19	2.27	21.45
Dec. 30.....	do.....	③27	57.60	.....	1.71	Nil.

① River almost frozen solid, this is the estimated discharge.

② Discharge taken with weir.

③ Velocity too small to affect meter.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Qu'Appelle River at Lumsden, for 1911.

DAY.	May.		June.		July.		August.	
	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	.....	.....	4.30	151	3.02	61	2.15	16
2.....	.....	.....	4.08	136	3.45	92	2.00	13
3.....	.....	.....	4.00	130	5.20	214	2.00	13
4.....	.....	.....	4.00	130	5.78	255	2.00	13
5.....	.....	.....	5.75	252	3.75	112	2.00	13
6.....	.....	.....	6.35	294	3.10	67	2.00	13
7.....	.....	.....	6.52	306	2.85	50	2.05	14
8.....	.....	.....	6.70	319	2.65	38	2.10	15
9.....	.....	.....	6.40	298	2.52	30	2.05	14
10.....	.....	.....	6.00	270	2.55	32	2.00	13
11.....	.....	.....	5.50	235	2.53	31	2.00	13
12.....	3.00	60	5.15	210	2.52	30	2.00	13
13.....	2.90	53	4.47	163	2.45	26	2.00	13
14.....	2.78	46	4.15	140	2.25	18	2.00	13
15.....	2.74	43	3.85	119	2.15	16	2.00	13
16.....	3.10	67	3.45	92	2.12	15	2.00	13
17.....	3.35	84	3.32	82	2.10	15	2.00	13
18.....	3.60	102	3.18	73	2.00	13	2.00	13
19.....	3.70	109	3.42	89	2.05	14	2.00	13
20.....	3.57	100	3.63	104	2.05	14	2.00	13
21.....	3.25	84	3.55	98	2.00	13	1.93	12
22.....	3.15	70	2.58	34	2.02	13	1.80	11
23.....	3.08	66	2.47	28	2.15	16	1.80	11
24.....	2.90	53	2.40	24	2.30	20	1.80	11
25.....	2.57	33	2.42	25	2.22	18	1.80	11
26.....	2.53	31	3.36	85	2.15	16	1.82	11
27.....	2.75	44	2.40	24	2.00	13	2.00	13
28.....	4.05	134	2.38	23	2.13	16	2.00	13
29.....	4.37	156	2.28	19	2.30	20	2.03	14
30.....	4.60	172	2.42	25	2.20	17	2.00	13
31.....	4.58	171	.....	.....	2.12	15	1.97	13

## DAILY GAUGE-HEIGHT AND DISCHARGE of Qu'Appelle River at Lumsden, for 1911.

DAY.	September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height <sup>1</sup>	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.87	12	2.00	13	..... ①.....	1.98	3.10	
2.....	1.85	12	2.00	13	.....	1.98	3.10	
3.....	1.80	11	2.12	15	.....	1.98	3.10	
4.....	2.00	13	2.15	16	.....	1.98	3.10	
5.....	1.95	12	2.10	15	.....	1.98	3.10	
6.....	1.85	12	2.05	14	.....	1.98	3.10	
7.....	1.85	12	2.05	14	.....	1.98	3.10	
8.....	1.85	12	2.00	13	.....	1.98	3.10	
9.....	1.80	11	2.00	13	.....	1.95	2.98	
10.....	1.80	11	2.00	13	.....	1.95	2.98	
11.....	2.75	44	2.00	13	.....	1.90	2.76	
12.....	3.85	120	2.00	13	2.15	3.86	1.90	2.76
13.....	4.00	130	1.95	12	2.15	3.86	1.87	2.62
14.....	4.20	144	1.95	12	2.15	3.86	1.86	2.58
15.....	3.65	106	1.90	12	2.15	3.88	1.86	2.58
16.....	3.15	70	1.88	12	2.15	3.86	1.86	2.58
17.....	2.60	35	1.85	12	2.15	3.86	1.87	2.62
18.....	2.37	23	1.85	12	2.15	3.86	1.87	2.62
19.....	2.30	20	1.90	12	2.15	3.86	1.90	2.76
20.....	2.22	18	2.25	18	2.15	3.86	1.90	2.76
21.....	2.13	16	2.40	24	2.15	3.86	1.90	2.76
22.....	2.00	13	2.52	30	2.15	3.86	1.90	2.76
23.....	2.00	13	2.42	25	2.15	3.86	1.90	2.76
24.....	2.00	13	2.37	23	2.15	3.86	1.88	2.66
25.....	2.00	13	2.25	18	2.15	3.86	1.88	2.66
26.....	2.00	13	2.17	16	2.05	3.42	1.88	2.66
27.....	2.00	13	2.05	14	2.05	3.42	1.88	2.66
28.....	2.00	13	2.00	13	2.05	3.42	1.85	2.54
29.....	2.00	13	..... ①.....	.....	2.00	3.20	1.83	2.44
30.....	2.00	13	.....	.....	2.00	3.20	1.80	2.32
31.....	.....	.....	.....	.....	.....	.....	1.76	2.14

① There was no observer from October 29 to November 11.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Qu'Appelle River at Lumsden, for 1912.

DAY.	January.		February.		March.		April.		May.		June	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.72	1.97	1.34	0.33	1.34	0.33	4.95	173	3.58	81	6.65	308
2.....	1.70	1.88	1.35	0.36	1.34	0.33	6.25	274	3.78	93	6.35	283
3.....	1.68	1.79	1.35	0.36	1.34	0.33	9.08	550	4.20	120	6.18	268
4.....	1.65	1.66	1.36	0.40	1.33	0.30	11.25	798	4.50	141	6.35	283
5.....	1.60	1.44	1.35	0.36	1.33	0.30	11.85	867	5.25	196	5.87	244
6.....	1.58	1.35	1.35	0.36	1.33	0.30	10.72	737	6.10	262	5.69	229
7.....	1.56	1.24	1.34	0.33	1.32	0.26	10.10	666	7.82	415	5.42	208
8.....	1.50	1.00	1.34	0.33	1.32	0.26	9.45	591	9.38	583	5.27	197
9.....	1.48	0.91	1.35	0.36	1.32	0.26	8.98	539	9.92	645	5.10	184
10.....	1.46	.82	1.35	0.36	1.34	0.33	8.60	497	10.02	657	5.12	186
11.....	1.45	0.78	1.35	0.36	1.34	0.33	8.95	536	9.34	579	5.22	194
12.....	1.40	0.56	1.35	0.36	1.32	0.26	9.00	541	9.35	580	5.20	192
13.....	1.38	0.48	1.35	0.36	1.33	0.30	9.30	574	9.68	618	4.91	170
14.....	1.38	0.48	1.35	0.36	1.34	0.33	9.25	569	10.70	735	4.68	154
15.....	1.38	0.48	1.35	0.36	1.34	0.33	8.95	536	11.35	810	4.58	147
16.....	1.35	0.36	1.35	0.36	1.34	0.33	8.65	503	11.80	862	4.55	144
17.....	1.35	0.36	1.35	0.36	1.34	0.33	7.95	428	12.00	884	4.56	145
18.....	1.35	0.36	1.35	0.36	1.34	0.33	7.02	340	11.92	875	4.56	145
19.....	1.34	0.33	1.35	0.36	1.34	0.33	6.50	296	11.72	852	4.39	133
20.....	1.34	0.33	1.35	0.36	1.34	0.33	6.08	260	11.55	833	4.49	140
21.....	1.34	0.33	1.35	0.36	1.34	0.33	5.78	236	10.78	744	3.85	97
22.....	1.34	0.33	1.35	0.36	1.34	0.33	5.38	206	10.08	664	3.62	83
23.....	1.34	0.33	1.35	0.36	1.34	0.33	5.14	188	9.30	574	3.50	76
24.....	1.36	0.40	1.35	0.36	1.44	0.74	4.95	173	8.50	486	3.53	78
25.....	1.36	0.40	1.35	0.36	1.44	0.74	4.78	160	7.72	405	3.48	75
26.....	1.37	0.44	1.35	0.36	1.44	0.74	4.45	138	7.62	395	3.40	70
27.....	1.35	0.36	1.34	0.33	2.10	3.64	4.29	126	9.38	583	3.37	68
28.....	1.34	0.33	1.34	0.33	2.10	3.64	4.13	116	8.82	521	3.50	76
29.....	1.34	0.33	1.34	0.33	4.55	144.0	4.45	138	7.38	373	3.58	81
30.....	1.35	0.36	.....	.....	4.85	166.0	3.80	94	7.00	339	3.72	89
31.....	1.35	0.36	.....	.....	4.80	162.0	.....	.....	6.70	312	.....	.....

## DAILY GAUGE-HEIGHT AND DISCHARGE of Qu'Appelle River, at Lumsden, for 1912.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.65	85	2.98	48	2.64	32	2.45	25	2.25	19	1.94	2.94
2.....	3.92	102	2.89	44	2.58	29	2.49	26	2.24	19	1.94	2.94
3.....	4.32	128	2.75	36	2.56	29	2.35	22	2.29	20	1.91	2.80
4.....	3.85	97	2.65	32	2.55	28	2.55	28	2.33	21	1.96	3.02
5.....	3.78	93	2.71	34	2.60	30	2.45	25	2.28	20	1.96	3.02
6.....	3.65	85	2.75	36	2.76	37	2.44	24	2.44	24	1.93	2.89
7.....	3.64	84	2.95	46	2.61	30	2.48	26	2.33	21	1.88	2.67
8.....	3.70	88	2.90	44	2.64	32	2.43	24	2.22	18	1.88	2.67
9.....	3.66	86	2.83	40	2.64	32	2.42	24	2.25	19	1.88	2.67
10.....	3.60	82	2.72	35	2.48	32	2.35	22	① 2.20	18②	2.01	3.24
11.....	3.62	83	2.66	32	2.47	25	2.37	22	① 2.15	17②	1.96	3.02
12.....	3.65	85	2.72	35	2.49	26	2.38	22	2.11	16	1.92	2.85
13.....	3.67	86	2.73	36	2.72	35	2.40	23	2.13	17	1.92	2.85
14.....	3.79	93	2.72	35	2.72	35	2.48	26	2.06	15	1.91	2.80
15.....	3.58	81	2.67	33	2.46	25	2.43	25	2.12	16	1.91	2.80
16.....	3.58	81	2.58	29	2.51	27	2.42	24	2.26	20	1.91	2.80
17.....	3.43	72	2.52	27	2.39	23	2.36	22	2.18	18	1.89	2.72
18.....	3.49	75	2.52	27	2.32	21	2.60	30	2.26	20	1.89	2.72
19.....	3.56	80	2.54	28	2.50	26	2.44	24	2.27	20	1.92	2.85
20.....	3.72	89	2.59	30	2.82	40	2.62	31	2.19	18	1.89	2.72
21.....	3.84	97	2.61	30	2.76	37	2.41	23	2.26	20	1.86	2.58
22.....	3.87	99	2.58	29	2.75	36	2.37	22	2.39	23	1.84	2.50
23.....	3.93	102	2.62	31	2.68	33	2.40	23	2.37	22	1.83	2.44
24.....	3.95	104	2.59	30	2.54	28	2.35	22	2.19	18②	1.82	2.41
25.....	3.84	97	2.70	34	2.48	26	2.35	22	2.10	14②	1.82	2.41
26.....	3.72	89	2.78	38	2.46	25	2.35	22	2.10	10②	1.79	2.28
27.....	3.54	78	2.64	32	2.46	25	2.35	22	2.01	7②	1.85	2.54
28.....	3.44	72	2.64	32	2.42	24	2.31	21	2.02	3.29	1.85	2.54
29.....	3.38	69	2.62	31	2.40	23	2.30	20	1.94	2.94	1.84	2.50
30.....	3.24	61	2.65	32	2.48	26	2.30	20	1.95	2.98	1.81	2.36
31.....	3.12	55	2.63	31	.....	.....	2.25	19	.....	.....	1.81	2.36

① Observer absent, gauge height interpolated.

② Discharge estimated.

## SESSIONAL PAPER No. 25d

## MONTHLY DISCHARGE of Qu'Appelle River at Lumsden, for 1911-12.

(Drainage area 6160 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911.						
May (12-31).....	172.0	31.0	83.9	0.013	0.01	3,328
June.....	319.0	19.0	133.0	0.022	0.02	7,914
July.....	255.0	13.0	42.6	0.007	0.01	2,619
August.....	16.0	11.0	12.9	0.002	0.002	793
September.....	184.0	11.0	32.4	0.005	0.01	1,928
October (1-28).....	30.0	12.0	15.4	0.002	0.002	855
November (12-30).....	3.86	3.20	3.72	0.001	0.000	140
December.....	3.10	2.14	2.77		0.000	170
The period.....					0.054	17,747
1912.						
January.....	1.97	0.33	0.727	0.0001	0.0001	45
February.....	40.4	0.33	0.355	0.0001	0.0001	20
March.....	166.0	0.26	15.8	0.002	0.002	971
April.....	867.0	94.0	395.0	0.064	0.071	23,504
May.....	884.0	81.0	523.0	0.084	0.097	32,158
June.....	308.0	68.0	158.0	0.002	0.002	9,402
July.....	128.0	55.0	86.4	0.014	0.016	5,312
August.....	48.0	27.0	34.1	0.006	0.007	2,097
September.....	37.0	21.0	29.0	0.005	0.006	1,726
October.....	30.0	19.0	23.6	0.004	0.005	1,451
November.....	24.0	2.98	16.6	0.003	0.003	988
December.....	3.24	2.36	2.71	0.0004	0.0005	167
The year.....					0.2097	77,841

## MOOSE JAW CREEK DRAINAGE BASIN.

*General Description.*

Moose Jaw Creek rises in the Yellowgrass marsh, which lies in Tps. 9 and 10, Rge. 17, W. 2nd Mer., and flows in a north and westerly direction until it reaches the city of Moose Jaw, where it is joined by Thunder Creek. From Moose Jaw it follows an easterly and northerly course, finally emptying into the Qu'Appelle River near Buffalo Pound Lake. From the headwaters to the city of Moose Jaw the drainage area is estimated at about one thousand eight hundred and thirty square miles. This area is almost entirely devoid of tree growth, except in the vicinity of Moose Jaw where the valley is lined with brush.

Throughout its entire length the creek flows in a very crooked but well defined channel. The upper portion of the valley is small, being merely a depression, but it gradually increases in size until at Drinkwater it is about thirty feet deep and at Moose Jaw about eighty feet deep. The fall in the creek is very small and particularly so between Drinkwater and Moose Jaw, where the total fall is only 67.5 feet or an average of 2.3 feet per mile of valley.

The Canadian Pacific Railway Company has dams at Milestone, Rouleau, Drinkwater, two at Moose Jaw and one at Pasqua. There is also a municipal dam in Sec. 19, Tp. 15, Rge. 24, W. 2nd Mer., which supplies water to the neighbourhood during periods when there is no flow in the creek. During 1912, the Canadian Pacific Railway Company began the construction of a new dam to replace their present dam in Moose Jaw. The city of Moose Jaw also began the construction of a dam for storage purposes below the Canadian Pacific Railway. The capacity of the reservoir is to be 2,650,000 cubic feet.

## MOOSE JAW CREEK NEAR LANG.

This station was established on June 21, 1911, by J. C. Keith. It is located at the traffic bridge on the road allowance east of the N.E.  $\frac{1}{4}$  Sec. 24, Tp. 11, Rge. 19, W. 2nd Mer., and is four miles west of the village of Lang.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the downstream face of the centre row of piles of the bridge. The zero of the gauge (elev. 95.07) is referred to a permanent iron bench mark (assumed elev. 100.00), located on the left bank of the stream 17 feet south of the last pile in the south approach of the bridge.



The channel is straight for 200 feet above and 150 feet below the station. Both banks are low and overflow in high stages of the stream. The bed of the stream is composed of clay, and in summer when the stream is very low becomes overgrown with vegetation. The current is sluggish at all stages.

Discharge measurements are made from the bridge in high stages of the stream and by wading, or with a weir, at some other section during low stages. The initial point for soundings at the bridge is the inner face of the south abutment.

The gauge was read during 1912 by Miss Irene Irvine.

### DISCHARGE MEASUREMENTS of Moose Jaw Creek, near Lang, in 1912.

Date.	Hydrographer.	Width.	* Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 22.....	D. D. MacLeod.....	38	81.5	0.25	2.60	20.05
June 24.....	H. D. St. A. Smith.....	38	62.25	0.25	2.01	15.60
July 10.....	do.....	38	42.06	①	1.55	①
July 25.....	do.....	38	36.54	0.095	1.35	3.14
Aug. 15.....	do.....	29.5	23.42	0.02	0.96	0.50
" 29.....	do.....	24	15.00	0.02	0.71	0.36
Sept. 11.....	do.....	.....	.....	.....	.....	Nil
Sept. 24.....	do.....	.....	.....	.....	.....	Nil
Oct. 9.....	do.....	.....	.....	.....	.....	Nil

① Impossible to get velocity with meter.

② Water standing in pools in creek.

### DAILY GAUGE-HEIGHT AND DISCHARGE of Moose Jaw Creek near Lang, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.01	30	2.15	14.9	3.20	34	1.70	7.7
2.....	4.15	51	2.15	14.9	3.15	33	1.80	9.2
3.....	4.69	61	3.30	36	3.10	32	1.70	7.7
4.....	4.20	52	3.60	41	3.00	30	1.70	7.7
5.....	4.60	59	4.70	61	2.85	28	1.70	7.7
6.....	4.45	56	5.80	81	2.80	27	1.60	6.3
7.....	4.20	52	5.70	79	2.80	27	1.55	5.6
8.....	4.21	52	5.70	79	2.80	27	1.45	4.5
9.....	4.15	51	5.65	78	2.80	27	1.40	4.
10.....	4.06	49	5.60	77	2.81	27	1.40	4.
11.....	3.98	48	5.55	76	2.75	26	1.65	7
12.....	3.90	46	5.45	74	2.65	24	1.65	7
13.....	3.70	43	5.20	70	2.60	23	1.65	7
14.....	3.70	43	4.80	63	2.65	24	1.65	7
15.....	3.69	43	4.60	59	2.65	24	1.65	7
16.....	3.69	43	4.45	56	2.60	23	1.60	6.3
17.....	3.68	42	4.20	52	2.55	22	1.55	5.6
18.....	3.68	42	4.10	50	2.45	20	1.45	4.5
19.....	3.67	42	4.05	49	2.35	18.5	1.45	4.5
20.....	3.67	42	3.00	30	2.20	15.8	1.45	4.5
21.....	2.61	23	3.90	46	2.20	15.8	1.45	4.5
22.....	2.60	23	3.80	45	2.15	14.9	1.45	4.5
23.....	2.48	21	3.80	45	2.15	14.9	1.48	4.8
24.....	2.46	20	4.71	43	2.15	14.9	1.45	4.5
25.....	2.40	19.4	3.60	41	2.15	14.9	1.40	4
26.....	2.35	18.5	3.50	39	2.10	14	1.37	3.6
27.....	2.25	16.7	3.55	40	2.10	14	1.37	3.6
28.....	2.15	14.9	3.50	39	2.05	13.2	1.32	3.1
29.....	2.15	14.9	3.45	38	2.05	13.2	1.31	3
30.....	2.15	14.9	3.40	37	1.90	10.7	1.27	2.6
31.....	.....	.....	3.30	36	.....	.....	1.24	2.3

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Moose Jaw Creek near Lang, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1.23	2.2	0.70	0.25	0.27	① Nil.	Dry.	Nil.
2	1.22	2.2	.70	.25	.27	"	"	"
3	1.22	2.2	.60	.18	.27	"	"	"
4	1.21	2.1	.60	.18	.27	"	"	"
5	1.20	2.0	.60	.18	.20	"	"	"
6	1.17	1.76	.60	.18	.15	"	"	"
7	1.15	1.6	.60	.18	.15	"	"	"
8	1.13	1.6	.59	.16	.15	"	"	"
9	1.15	1.6	.58	.15	.15	"	"	"
10	1.13	1.48	.58	.15	.15	"	"	"
11	1.15	1.6	.55	.12	.15	"	"	"
12	1.05	1.	.45	.08	.15	"	"	"
13	1.03	0.92	.35	① Nil.	.15	"	"	"
14	1.01	.84	.30	"	.15	"	"	"
15	0.96	.64	.30	"	.15	"	"	"
16	.97	.68	.30	"	.15	"	"	"
17	.96	.64	.30	"	.14	"	"	"
18	.93	.54	.30	"	.14	"	"	"
19	.90	.45	.25	"	.13	"	"	"
20	.85	.35	.25	"	.13	"	"	"
21	.84	.39	.25	"	.12	"	"	"
22	.83	.38	.25	"	.11	"	"	"
23	.82	.37	.25	"	.10	"	"	"
24	.80	.35	.25	"	.10	"	"	"
25	.70	.25	.25	"	.10	"	"	"
26	.69	.24	.25	"	.09	"	"	"
27	.65	.20	.25	"	.09	"	"	"
28	.70	.25	.25	"	.09	"	"	"
29	.70	.25	.25	"	.07	"	"	"
30	.70	.25	.27	"	.05	"	"	"
31	.70	.25			.03	"	"	"

① Water Standing in pools from Sept. 13 to Oct. 31.

## MONTHLY DISCHARGE of Moose Jaw Creek near Lang, for 1912.

(Drainage 189 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April	61	14.9	37.8	0.20	0.223	2,249
May	81	14.9	51.3	0.271	0.312	3,154
June	34	10.7	21.8	0.115	0.128	1,297
July	9.2	2.3	5.33	0.028	0.032	328
August	2.2	0.2	0.954	0.005	0.006	580
September	.25	0.08	0.069	0.0004	0.0004	4
October						Nil.
November						Nil.
The period					0.7014	7,612

## MOOSE JAW CREEK AT CHEVRIER'S FARM.

This station was established on April 13, 1910, by P. M. Sauder. It is located at the traffic bridge on the road allowance east of the N.E.  $\frac{1}{4}$  Sec. 15, Tp. 15, Rge. 25, W. 2nd Mer., and is about seventeen and one-half miles southeast of Moose Jaw.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a pile on the downstream side of the bridge. The zero of the gauge (elev. 87.29) is referred to a permanent iron bench mark (assumed elev. 100.00), situated on the left bank 51 feet downstream from the bridge.

The channel is straight for 200 feet above and 100 feet below the station. The right bank is partly covered with brush and overflows during flood stages of the stream. The left bank is also partly covered with brush but is high and not liable to overflow. The bed is composed of soft clay (mud) but is free from vegetation and is not liable to shift except during very high water.

Discharge measurements are made from the bridge during high water. The initial point for soundings is the south end of the handrail of the bridge. During low water the discharge is measured by wading, or with a weir, near the bridge.

During 1912, the gauge was read by Jerry Chevrier.

### DISCHARGE MEASUREMENTS of Moose Jaw Creek at Chevrier's Farm, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 19	D. D. MacLeod	75	178.7	0.74	5.42	131.72
June 22	H. D. St. A. Smith.	57	58.35	0.56	3.25	32.72
July 9	do	59	59.17	0.50	3.41	29.79
July 24	do	28	20.12	0.31	2.72	6.26
Aug. 10	do	28	19.5	0.37	2.74	7.51
Aug. 27	do	12	4.5	0.15	2.25	0.68
Sept. 10	do	①			2.05	Nil.
Oct. 8	do	②				Nil.
Oct. 21	do	③				Nil.
Nov. 6	do	④				Nil.

① Water standing in pools.

② Creek dry.

### DAILY GAUGE-HEIGHT AND DISCHARGE of Moose Jaw Creek at Chevrier's Farm, for 1912.

DAY.	April.		May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4.6	91	3.60	42	4.65	94	2.90	12.5	1.60	5	2.20	0.50
2	4.4	82	3.60	42	4.60	91	2.90	12.5	1.40	5	2.20	0.50
3	5.35	128	3.60	42	4.50	87	2.90	12.5	1.30	5	2.20	0.50
4	6.60	189	3.70	47	4.40	82	2.90	12.5	2.70	6.5	2.20	0.50
5	7.60	238	5.70	145	4.30	77	3.10	19.5	2.90	12.50	2.20	0.50
6	8.30	273	8.20	1267	4.30	77	3.30	28	2.90	12.50	2.20	0.50
7	8.90	302	10.20	367	4.20	72	3.30	28	2.90	12.50	2.20	0.50
8	9.75	344	11.70	439	1.20	72	3.50	38	2.90	12.50	2.20	0.50
9	10.60	385	12.60	483	4.00	62	3.55	30	2.90	12.50	2.20	0.50
10	10.80	395		7	3.80	52	3.20	24	2.70	6.5	2.05	③
11	10.20	367			3.55	40	3.20	24	2.70	6.5	Dry	Nil
12	9.00	307			3.40	33	3.20	24	2.60	4.5	"	"
13	8.40	278			3.40	33	3.40	33	2.60	4.5	"	"
14	7.20	219			3.30	28	4.10	67	2.60	4.5	"	"
15	6.80	199			3.10	19.5	4.30	77	2.60	4.5	"	"
16	6.40	180	12.90	1494	3.00	15.5	4.45	84	2.70	6.5	"	"
17	6.20	170	12.70	488	2.85	10.8	4.20	72	2.60	4.5	"	"
18	5.60	140	12.20	464	2.90	12.5	4.00	62	2.60	4.5	"	"
19	5.40	131	10.40	395	2.90	12.5	4.00	62	2.60	4.5	"	"
20	5.00	111	9.50	532	2.85	10.8	3.90	57	2.50	3.2	"	"
21	4.90	106	8.80	297	2.80	9.2	3.70	47	2.45	2.8	"	"
22	4.70	96	7.30	225	3.20	22	3.60	42	2.45	2.8	"	"
23	4.50	86	7.10	214	3.15	22	3.40	33	2.40	2.2	"	"
24	4.30	77	6.80	199	2.95	14.5	3.20	24	2.40	2.2	"	"
25	4.20	72	6.50	181	2.90	12.5	2.90	12.5	2.30	1.2	"	"
26	4.00	62	6.30	175	2.90	12.5	2.40	2.2	2.30	1.2	"	"
27	3.80	52	5.20	121	2.80	9.2	2.10	5	2.30	1.2	"	"
28	3.80	52	5.00	111	2.80	9.2	2.10	5	2.30	1.2	"	"
29	3.80	52	4.80	101	2.80	9.2	2.00	5	2.30	1.2	"	"
30	3.70	47	4.70	96	2.80	9.2	2.00	5	2.30	1.2	"	"
31			4.70	96			2.00	③	2.35	1.8	"	"

③ Discharge estimated April 5 to April 15, May 6 to May 9 and May 16 to May 24.

④ Water very high May 10 to May 16, impossible to make good estimate as there were no gauge heights obtained.

⑤ Water standing in pools, no flow.

## SESSIONAL PAPER No. 25d

## MONTHLY DISCHARGE of Moose Jaw Creek at Chevrier's Farm, for 1912.

(Drainage area 1350 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Persquare Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	395	47	174	0.129	0.14	10,354
May (1-9 and 16-31).....	494	42	235	0.174	0.16	11,653 ①
June.....	94	9.2	37.1	0.027	0.03	2,208
July.....	84	2.2	30.3	0.022	0.02	1,863
August.....	12.5	1.2	4.58	0.003	0.004	282
September.....	50.0	0.0	0.15	0.0001	0.0001	9
October.....						Nil.
November (1-15).....						Nil.
The period.....					0.3541	26,369

① This does not include the high water period from May 10 to 15.

## MOOSE JAW CREEK AT MCCARTHY'S FARM.

This station was established on April 7, 1910, by P. M. Sauder and W. H. Greene. It is located at the traffic bridge on the N.W.  $\frac{1}{4}$  Sec. 16, Tp. 16, Rge. 26, W. 2nd Mer., and is three miles south of Moose Jaw.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the inner face of the right abutment of the bridge. The zero of the gauge (elev. 82.99) is referred to a permanent iron bench mark (assumed elev. 100.00), situated 33.5 feet northeast of the gauge.

The stream flows in one channel, which is straight for about 100 feet above and 300 feet below the station. The right bank is high, slightly wooded, and not liable to overflow. The left bank is low, partly wooded and liable to overflow. The bed of the stream is composed of gravel, and is not liable to shift except during high water.

During high water discharge measurements are made from the downstream side of the bridge, but in low water they are made by wading at a section about 30 feet downstream. The initial point for soundings is at the west end of the handrail of the bridge.

The gauge was read during 1912 by V. J. McCarthy and members of his household.

## DISCHARGE MEASUREMENTS of Moose Jaw Creek at McCarthy's Farm, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 22.....	J. C. Keith.....	①.....				Nil.
Feb. 13.....	do.....	①.....				Nil.
April 20.....	D. D. MacLeod.....	31.0	84.75	1.76	2.15	142.29
May 6.....	do.....	31.0	81.75	1.79	2.13	146.03
May 20.....	do.....	64.0	317.82	2.27	6.11	721.80
June 21.....	H. D. St. A. Smith.....	33.0	58.40	0.44	0.99	25.68
July 8.....	do.....	32.6	55.85	0.44	1.00	24.20
July 23.....	do.....	33.0	57.66	0.59	1.10	34.17
Aug. 9.....	do.....	32.0	42.76	0.12	0.66	5.23
Aug. 26.....	do.....	②19.0	7.00	0.41	0.54	3.36
Sept. 9.....	do.....	②18.0	7.40	0.12	0.45	0.92
Sept. 23.....	do.....	②17.0	7.70	0.15	0.49	1.13
Oct. 7.....	do.....	②17.5	9.05	0.15	0.54	1.34
Oct. 22.....	do.....	21.0	7.66	0.11	0.53	0.89
Nov. 5.....	do.....	31.5	41.36	0.07	0.51	3.07
Nov. 20.....	do.....	31.5	39.34	0.03	0.51	1.33
Dec. 6.....	do.....				0.45	

① Creek frozen solid.

② Taken at wading station.

③ Not enough water to use meter.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Moose Jaw Creek at McCarthy's Farm, for 1912.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.47	0.14	.....	Nil.	.....	Nil.	1.25	.....	1.29	51	1.88	111
2.....	0.47	0.14	.....	"	.....	"	1.46	.....	1.22	44	1.78	100
3.....	0.47	0.14	.....	"	.....	"	1.64	.....	1.16	39	1.76	98
4.....	0.47	0.14	.....	"	.....	"	1.91	①.....	1.40	61	1.59	80
5.....	0.46	0.11	.....	"	.....	"	2.54	189	1.42	63	1.55	76
6.....	0.46	0.11	.....	"	.....	"	3.42	305	2.05	130	1.56	77
7.....	0.46	0.11	.....	"	.....	"	4.22	424	3.00	248	.60	81
8.....	0.45	0.08	.....	"	.....	"	4.61	482	4.75	503	1.58	79
9.....	0.45	0.08	.....	"	.....	"	4.59	479	5.55	473	1.58	79
10.....	0.45	0.08	.....	"	.....	"	5.13	560	6.82	824	1.58	79
11.....	0.45	0.08	.....	"	.....	"	5.62	634	8.46	1,070	1.55	76
12.....	0.44	0.05	.....	"	.....	"	5.55	623	9.58	1,238	1.20	42
13.....	0.44	0.05	.....	"	.....	"	4.98	538	10.14	1,322	1.18	41
14.....	0.40	0.01	.....	"	.....	"	3.94	381	10.19	1,329	1.20	42
15.....	0.40	0.01	.....	"	.....	"	3.42	305	9.77	1,266	1.23	45
16.....	.....	①.....	.....	"	.....	①.....	3.00	248	9.20	1,180	1.18	41
17.....	.....	Nil	.....	"	.....	"	2.76	216	8.47	1,071	1.02	28
18.....	.....	"	.....	"	.....	"	2.54	188	7.76	964	0.94	21
19.....	.....	"	.....	"	.....	"	2.33	164	6.90	836	0.89	17
20.....	.....	"	.....	"	.....	"	2.17	144	6.09	714	0.90	18
21.....	.....	"	.....	"	.....	"	2.02	126	5.16	564	1.00	26
22.....	.....	"	.....	"	.....	"	1.90	114	4.18	418	1.03	28
23.....	.....	"	.....	"	.....	"	1.76	98	3.52	320	1.04	29
24.....	.....	"	.....	"	.....	"	1.62	83	3.12	263	1.04	29
25.....	.....	"	.....	"	1.83	①.....	1.58	79	2.80	222	0.98	24
26.....	.....	"	.....	"	1.46	.....	1.54	75	2.75	215	0.96	23
27.....	.....	"	.....	"	1.25	.....	1.44	65	2.58	194	0.92	20
28.....	.....	"	.....	"	1.11	.....	1.37	58	2.26	155	0.88	17
29.....	.....	"	.....	"	1.05	.....	1.37	58	2.08	134	0.85	15
30.....	.....	"	.....	"	1.43	.....	1.30	52	2.02	126	0.84	14
31.....	.....	"	.....	"	1.40	.....	.....	.....	1.95	119	.....	.....

① Ice solid to bottom of Creek.

② Slight flow started probably about this date.

③ Not sufficient data to compute discharge.

④ Creek clear of ice.

## SESSIONAL PAPER No. 25d

## DAILY GAUGE-HEIGHT AND DISCHARGE of Moose Jaw Creek at McCarthy's Farm, for 1912.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0 86	16	0 50	1 25	0 50	1 25	0 52	1 55	0 55	2 0	0 44	0 05
2.....	0 87	16	0 50	1 25	0 47	0 95	0 54	1 85	0 55	2 0	0 42	0 02
3.....	0 86	16	0 48	1 05	0 48	1 05	0 54	1 85	0 54	1 86	0 44	0 05
4.....	0 86	16	0 47	0 95	0 48	1 05	0 53	1 70	0 52	1 55	0 44	0 05
5.....	0 90	18	0 49	1 15	0 48	1 05	0 52	1 55	0 51	1 40	0 44	0 05
6.....	0 89	17	0 48	1 05	0 48	1 05	0 51	1 40	0 51	1 40	0 45	0 05
7.....	0 93	20	0 55	2 0	0 46	0 85	0 52	1 55	0 53	1 70	0 45	0 05
8.....	1 00	26	0 68	6 2	0 45	0 75	0 54	1 85	0 52	1 55	0 43	0 05
9.....	0 99	25	0 67	5 8	0 45	0 75	0 54	1 85	0 52	1 55	0 43	0 03
10.....	1 00	26	0 65	5 0	0 45	0 75	0 53	1 70	0 52	1 55	0 47	0 14
11.....	1 00	26	0 65	5 0	0 44	0 70	0 54	1 85	0 53	1 70	0 43	0 03
12.....	0 98	24	0 64	4 7	0 44	0 70	0 56	2 3	0 54	1 85	0 38	0 02
13.....	0 98	24	0 64	4 7	0 43	0 65	0 56	2 3	0 52	1 55	0 38	0 02
14.....	0 95	22	0 64	4 7	0 44	0 70	0 55	2 0	0 52	1 55	0 38	0 02
15.....	1 01	27	0 62	4 1	0 40	0 50	0 55	2 0	0 52	1 55	0 39	0 02
16.....	1 23	45	0 60	3 5	0 40	0 50	0 55	2 0	0 52	1 55	0 36	0 02
17.....	1 30	52	0 60	3 5	0 40	0 50	0 56	2 3	0 52	1 55	0 38	0 02
18.....	1 33	54	0 60	3 5	0 39	0 45	0 57	2 6	0 52	1 55	0 39	0 02
19.....	1 28	50	0 62	4 1	0 35	0 40	0 56	2 3	0 52	1 55	0 43	0 03
20.....	1 26	48	0 60	3 5	0 45	0 75	0 54	1 85	0 52	1 55	0 44	0 05
21.....	1 10	34	0 59	3 2	0 52	1 55	0 54	1 85	0 52	1 55	0 45	0 05
22.....	1 06	31	0 58	2 9	0 51	1 40	0 54	1 85	0 52	1 50	0 46	0 05
23.....	1 10	34	0 56	2 3	0 50	1 25	0 54	1 85	0 52	1 50	0 47	0 06
24.....	1 04	29	0 55	2 0	0 49	1 15	0 55	2 0	0 51	1 00	0 54	0 07
25.....	0 98	24	0 55	2 0	0 50	1 25	0 55	2 0	0 50	0 75	0 59	0 07
26.....	0 88	17	0 54	1 85	0 51	1 40	0 55	2 0	0 49	0 50	0 59	0 07
27.....	0 60	3 5	0 52	1 55	0 50	1 25	0 55	2 0	0 48	0 25	0 59	0 07
28.....	0 57	2 6	0 52	1 55	0 50	1 25	0 55	2 0	0 44	0 05	0 61	0 08
29.....	0 56	2 3	0 54	1 85	0 49	1 15	0 55	2 0	0 44	0 05	0 69	0 08
30.....	0 54	1 85	0 51	1 40	0 50	1 25	0 55	2 0	0 44	0 05	0 69	0 08
31.....	0 53	1 70	0 50	1 25	.....	.....	0 55	2 0	.....	.....	0 72	0 08

## MONTHLY DISCHARGE of Moose Jaw Creek at McCarthy's Farm, for 1912.

(Drainage area square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	0 14	0 01	0 095	0 00005	0 00003	3
February.....	.....	.....	.....	.....	.....	NIL.
March.....	.....	.....	.....	.....	.....	①.
April (5-30).....	634 0	52 0	257 2	0 143	0 16	33 264
May.....	1 329 0	39 0	521 2	0 291	0 34	32 045
June.....	111 0	14 0	48 5	0 027	0 03	2 806
July.....	54 0	1 6	23 8	0 013	0 02	1 466
August.....	6 2	0 95	2 87	0 002	0 002	176
September.....	1 55	0 40	0 94	0 0005	0 0006	56
October.....	2 6	1 40	1 93	0 001	0 001	119
November.....	2 0	0 05	1 32	0 00007	0 0008	79
December.....	0 14	0 02	0 049	0 00002	0 00002	3
The period.....	.....	.....	.....	.....	0 55445	50,017 ①

①Not sufficient data to compute discharge accurately.

①During the last 15 days of March there was an approximate run-off of 250 acre-feet, and during the first four days of April an approximate run-off of 500 acre-feet, making a total of 750 acre-feet, which must be added to obtain the total run-off for the year.

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Moose Jaw Creek Drainage Basin, in 1912.

DATE.	Hydrographer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge
				<i>Feet.</i>	<i>Sq.-feet.</i>	<i>Feet per sec.</i>	<i>Sec.-ft.</i>
Dec. 6	H.D.St.A.Smith	Thunder Creek	S.W. 32-15-25-2	7	27	0.93	25

## SOURIS RIVER DRAINAGE BASIN.

*General Description.*

The source of the Souris River is in marshes near Yellow Grass, Saskatchewan. From here it flows in a southeasterly direction, almost paralleling the Soo line of the Canadian Pacific Railway to Estevan, then flows east to Oxbow where it turns south and crosses the international boundary in Rge. 34, W. of Principal Meridian. After making a loop into North Dakota it re-crosses the international boundary in Rge. 27, W. 1st Mer., and flows in a northeasterly direction to Souris, Manitoba, where it turns east and finally joins the Assiniboine River in Tp. 8, Rge. 16, W. 1st Mer.

The chief tributaries of Souris River are Long Creek, which joins it near Estevan, Moose Mountain Creek near Oxbow, North and South Antler Creeks near Sourisford and Pipestone Creek near Souris.

This stream drains a large tract of typical western plains. The rainfall will probably average very little over fifteen inches and is usually sufficiently divided over the year to prevent excessive run-off, or floods. At times when there is an unusual amount of rainfall and in the early spring, the water drains into the streams very rapidly and causes floods of short duration.

There are towns, villages and farms all along the course of this stream and its tributaries which depend on it for domestic and industrial water supply. The Canadian Pacific Railway is a large consumer. The town of Estevan is establishing a waterworks system and there is a proposed system at Weyburn to divert water from Souris River. In North Dakota it has been proposed to divert water for irrigation purposes.

## LONG CREEK NEAR ESTEVAN.

\* This station was established on June 22, 1911, by J. C. Keith. It is located on the S.E.  $\frac{1}{4}$  Sec. 10, Tp. 2, Rge. 8, W. 2nd Mer., and is about half a mile above the mouth of the creek and about two and a half miles south of the town of Estevan.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the shore face of the first row of piles from the north end of the bridge. The zero of the gauge (elev. 83.87) is referred to a permanent iron bench mark (assumed elev. 100.00) on the right bank near the end of the bridge.

The channel is straight for 100 feet above and below the station. Both banks are steep but are liable to be flooded during very high stages of the stream; both are also covered with brush. The bed of the stream is composed of clean gravel which is not liable to shift. The current is sluggish.

During high water, discharge measurements are made from the bridge, but during low stages a wading section elsewhere, where the current is swifter, must be used. The initial point for soundings at the bridge is the inner face of the left abutment.

During 1911 and 1912, the gauge was read by Mr. Geo. Pawson and Mr. E. H. Smith.

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## DISCHARGE MEASUREMENTS of Long Creek near Estevan, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
June 1.....	J. C. Keith.....	22.5	38.23	0.77	.....	29.35
June 22.....	do.....	23.0	28.01	0.40	1.445	11.19
July 18.....	do.....	10.5	2.80	0.61	0.81	1.71
Aug. 23.....	do.....	5.6	1.44	0.43	0.72	0.62
Oct. 18.....	do.....	34.5	116.13	0.75	3.35	86.80
1912.						
April 23.....	D. D. MacLeod.....	36	118.70	0.88	2.82	103.93
May 9.....	do.....	39	246.95	1.13	6.20	279.46
June 25.....	H. D. St. A. Smith.....	32	60.80	0.39	1.33	24.79
July 11.....	do.....	33	56.25	2.04	1.11	11.50
July 26.....	do.....	31	48.98	0.17	1.00	8.09
Aug. 12.....	do.....	30	47.4	0.07	0.78	3.20
Aug. 29.....	do.....	25	35.95	0.05	0.81	1.92
Sept. 12.....	do.....	30	46.80	0.03	0.84	1.21
Sept. 27.....	do.....	36.5	72.87	0.05	1.60	3.68
Oct. 12.....	do.....	36	87.41	0.05	1.85	4.62
Oct. 26.....	do.....	36	89.91	0.05	1.85	4.33
Nov. 12.....	do.....	36	83.05	0.05	1.88	3.91

## DAILY GAUGE-HEIGHT AND DISCHARGE of Long Creek near Estevan, for 1911.

DAY.	June.		July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.16	4.9	0.69	0.48	0.69	0.48	0.75	0.75
2.....			1.10	4.0	0.69	0.48	0.68	0.45	0.95	2.0
3.....			1.08	3.7	0.80	1.0	0.67	0.42	0.93	1.8
4.....			1.06	3.4	0.76	0.80	0.67	0.42	0.90	1.5
5.....			1.04	3.1	0.75	0.75	0.69	0.48	0.86	1.3
6.....			0.99	2.4	0.75	0.75	0.61	0.27	0.82	1.10
7.....			0.95	2.0	0.74	0.70	0.72	0.60	0.82	1.10
8.....			1.03	3.0	0.74	0.70	0.75	0.75	0.79	0.95
9.....			0.95	2.0	0.74	0.70	0.72	0.60	0.76	0.80
10.....			0.95	2.0	0.74	0.70	0.70	0.50	0.76	0.80
11.....			0.92	1.7	0.74	0.70	0.67	0.42	0.75	0.75
12.....			0.90	1.5	0.73	0.65	0.67	0.42	0.75	0.75
13.....			0.85	1.25	0.72	0.60	0.67	0.42	0.75	0.75
14.....			0.83	1.15	0.72	0.60	0.67	0.42	0.75	0.75
15.....			0.85	1.25	0.72	0.60	0.67	0.42	0.73	0.65
16.....			0.83	1.15	0.82	1.10	0.68	0.45	0.73	0.65
17.....			0.81	1.05	0.80	1.00	0.68	0.45	3.20	80
18.....			0.81	1.05	0.78	0.90	0.68	0.45	3.40	90
19.....			0.85	1.25	0.76	0.80	0.68	0.45	3.20	80
20.....			0.82	1.1	0.75	0.75	0.69	0.48	3.04	72
21.....			0.80	1.0	0.76	0.80	0.71	0.55	2.90	66
22.....	1.44	11.	0.76	0.80	0.75	0.75	0.71	0.55	2.75	59
23.....	1.44	11	0.81	1.05	0.72	0.60	0.74	0.70	2.62	53
24.....	1.44	11	0.79	0.95	0.71	0.55	0.81	1.05	2.48	47
25.....	1.42	10.5	0.75	0.75	0.71	0.55	0.76	0.80	2.35	42
26.....	1.39	9.8	0.71	0.55	0.71	0.55	0.76	0.80	2.25	38
27.....	1.36	9.0	0.71	0.55	0.73	0.65	0.75	0.75	2.20	36
28.....	1.35	8.8	0.71	0.55	0.72	0.60	0.76	0.80	2.13	33
29.....	1.29	7.3	0.70	0.50	0.73	0.55	0.84	1.20	1.95	26
30.....	1.21	5.7	0.70	0.50	0.71	0.55	0.75	0.75	1.90	24
31.....			0.69	0.48	0.90	1.50				①

① Observer absent.



## DAILY GAUGE-HEIGHT AND DISCHARGE of Long Creek near Estevan, for 1912.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2.94	①	2.10	57	2.95	100		
2.	4.65		2.05	54	2.79	92		
3.	7.10		1.96	50	2.65	84		
4.	9.10		2.23	64	2.48	76		
5.	8.60		2.42	73	2.36	70		
6.	8.10		3.00	102	2.20	62		
7.		④	3.50	127	2.15	60		
8.			4.48	176	2.10	57		
9.			6.05	270	2.05	54		
10.			6.15	⑤	2.00	52		
11.			6.75		1.95	50		
12.			10.00		1.88	46		
13.			11.00		1.79	42		
14.			6.50		1.69	37		
15.	5.70	2.49	6.40		1.75	40		
16.	5.15	2.16		③	1.69	37		
17.	4.10	157	5.40	231	1.69	37		
18.	4.00	152	4.60	183	1.68	36.5	1.10	13
19.	3.70	137		③	1.66	36	1.10	13
20.	3.39	122			1.60	34	1.10	13
21.	3.25	114			1.55	32		⑦
22.	3.05	104	3.41	122	1.50	30		
23.	2.90	97	3.35	120	1.43	26		
24.	2.70	87	3.25	114	1.40	26		
25.	2.55	80	3.12	108	1.38	24		
26.	2.40	72	2.98	101		③		
27.	2.25	64	3.22	113				
28.	2.15	60	3.44	124				
29.	2.15	60	3.36	120				
30.	2.15	60	3.22	113				
31.			3.06	105				

① Water over gauge, gauge heights calculated from May 10 to May 15.

② Observer absent May 18 to May 21, June 26 to July 17, and July 21 to Aug. 1.

③ Ice running in creek.

④ Water over top of gauge.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Long Creek near Estevan, for 1912.

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.90	6.5	0.77	②2.1	1.72	4	1.85	4.3
2.....	.90	6.5	.75	2.5	1.74	4.1	1.85	4.3
3.....	.89	6.2	.72	2	1.72	4	1.86	4.3
4.....	.88	5.9	.69	2	1.75	4.1	1.88	4.4
5.....	.87	5.6	.70	2	1.77	4.1	1.90	4.4
6.....	.86	5.3	.72	2	1.78	④4.2	1.90	4.4
7.....	.84	4.7	.70	2	1.80	④4.2	1.90	4.4
8.....	.83	4.4	.74	2.1	1.85	④4.3	1.89	4.4
9.....	.80	3.5	.75	2.1	1.86	④4.3	1.88	4.4
10.....	.80	3.5	.82	2.2	1.87	4.3	1.85	4.3
11.....	.79	3.3	.85	2.3	1.88	4.4	1.85	4.3
12.....	.78	3.1	.90	2.4	1.89	4.4	1.85	4.3
13.....	.78	3.1	.98	2.6	1.89	④4.4	1.86	4.3
14.....	.77	2.9	1.00	②2.6	1.89	4.4	1.89	4.4
15.....	.76	2.7	1.02	②2.6	1.90	4.4	1.89	4.4
16.....	.77	②2.9	1.05	2.7	1.90	4.4	.....	.....
17.....	.78	③3.1	1.12	2.8	1.90	4.4	.....	.....
18.....	.80	③3.5	1.19	3.0	1.90	4.4	.....	.....
19.....	.80	③3.5	1.24	3.1	1.89	4.4	.....	.....
20.....	.80	③3.5	1.29	3.2	1.89	④4.4	.....	.....
21.....	.80	3.5	1.40	3.4	1.90	4.4	.....	.....
22.....	.80	3.5	1.45	③3.5	1.86	4.3	.....	.....
23.....	.78	3.1	1.50	3.6	1.85	4.3	.....	.....
24.....	.86	5.3	1.51	3.6	1.89	4.4	.....	.....
25.....	.85	⑤5.0	1.54	3.7	1.89	4.4	.....	.....
26.....	.84	4.7	1.60	3.8	1.85	4.3	.....	.....
27.....	.80	3.5	1.62	3.8	1.85	4.3	.....	.....
28.....	.80	3.5	1.65	3.9	1.85	4.3	.....	.....
29.....	.81	3.8	1.68	4.0	1.84	4.3	.....	.....
30.....	.80	2.2	1.70	4.0	1.84	4.3	.....	.....
31.....	.79	2.2	.....	.....	1.84	4.3	.....	.....

③ Observer absent Gauge height interpolated.

## MONTHLY DISCHARGE of Long Creek near Estevan, for 1911-12.

(Drainage area 1380③ square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.		
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911.						
June (22-30).....	11	5 7	9.34	0.007	0.002	166
July.....	4.9	0.48	1.63	0.001	0.001	100
August.....	1.5	0.48	0.723	0.0005	0.0006	44
September.....	1.2	0.27	0.557	0.0004	0.0004	33
October (1-30).....	90	0.65	25.4	0.019	0.021	1,511
The period.....					0.025	1,854
1912.						
April (15-30).....	249	60	114	0.083	0.046	3,631
May (1-9) and (17-18) and (22-31).....	270	50	220	0.159	0.122	5,012
June (1-25).....	100	24	49.6	0.036	0.033	2,460
July (18-20).....	13	13	13	0.009	0.001	77
August.....	6.5	2.2	4	0.003	0.003	246
September.....	4.0	2.0	28.5	0.002	0.002	170
October.....	4.4	4 0	4 29	0.003	0.003	255
November (1-15).....	4.4	4.3	4.35	0.003	0.002	129
The period.....					0.212	11,980

③ This area is very approximate, due to lack of reliable data.

## SOURIS RIVER NEAR ESTEVAN.

This station was established on June 23, 1911, by J. C. Keith. It is located about 50 feet below the Canadian Pacific Railway Company's dam on the N.E.  $\frac{1}{4}$  Sec. 11, Tp. 2, Rge. 8, W. 2nd Mer., and is about two miles south and three quarters of a mile east of the town of Estevan, and about three quarters of a mile below the mouth of Long Creek.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a heavy timber sunk in and anchored to the left bank. The zero of the gauge (elev. 82.45) is referred to a permanent iron bench mark (assumed elev. 100.00) on the right bank and about 47 feet south-east of the end of the C.P.R. dam.

The channel is straight for about 100 feet above and below the gauge. Both banks are steep, but become submerged in very high water; they are also both covered with brush. The bed of the stream is covered with cinders from the Canadian Pacific Railway's power house and the section is liable to slight change due to the dumping of cinders on the banks.

Discharge measurements can only be made by wading at the gauge, as the cross-sections at the bridges in that locality are affected by backwater. The flood discharge is estimated by use of suitable weir formulae for the dam above.

During 1911 and 1912, the gauge was read by Mr. Wm. Bevan.

## DISCHARGE MEASUREMENTS of Souris River near Estevan, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
June 23.....	J. C. Keith.....	14.4	7.61	1.59	1.36	12.13
July 18.....	do .....	10.0	2.64	1.17	0.93	3.10
Aug. 23.....	do .....	7.1	1.43	0.69	0.79	0.995
1912.						
June 25.....	H. D. St. A. Smith.....	16.7	13.03	1.62	1.54	21.10
July 11.....	do .....	15	8.70	1.65	1.35	14.38
July 26.....	do .....	14	7.90	1.39	1.24	10.98
Aug. 12.....	do .....	13	6.48	1.07	1.17	7.18
Aug. 29.....	do .....	12	4.90	1.18	1.14	5.78
Sept. 12.....	do .....	10	3.66	0.61	1.03	2.24
Sept. 27.....	do .....	11	4.39	0.63	1.08	2.77
Oct. 12.....	do .....	15	8.91	1.10	1.28	9.79
Oct. 26.....	do .....	15	8.28	1.04	1.25	8.63
Nov. 12.....	do .....	13	4.67	0.88	1.17	4.13
Nov. 21.....	do .....	13	4.85	1.04	1.15	5.04
Dec. 7.....	do .....	13	4.50	0.80	1.10	3.60
Dec. 26.....	do .....	11	2.50	0.80	1.03	2.01

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Souris River near Estevan, for 1911.

DAY.	June.		July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1.08	4 9	0.75	50	0.74	42	1.08	5 0	2 05	34
2.....			1.02	3 8	0.75	50	0.75	50	1.10	5 4	2 04	33
3.....			1.00	3 4	0.88	1.83	0.76	60	1.60	19.6	2 00	32
4.....			1.00	3 4	0.90	2 0	0.76	60	1.65	21.	1 90	29
5.....			0.94	2 6	0.88	1.83	0.74	42	1.64	21	1 87	28
6.....			0.90	2 0	0.90	2 0	0.77	70	1.60	20	1.64	21
7.....			0.89	1.94	0.91	2 2	0.76	60	1.50	16.5	1.48	16.5
8.....			1.70	22 7	0.93	2.4	0.78	80	1.50	16.5	1 40	13.4
9.....			1.67	22	0.89	1.94	0.81	1.10	1.48	15.9	1 40	13.4
10.....			1.37	12 5	0.88	1.83	0.81	1.10	1.40	13.4	1.38	12.8
11.....			1.07	4 7	0.86	1.61	0.82	1 20	1.35	11.8	1 35	11.8
12.....			1.03	4 0	0.85	1 50	0.86	1.61	1.30	10 4	1.34	11.6
13.....			1.00	3 4	0.83	1.30	0.86	1 61	1.28	9.8	1 30	10.4
14.....			0.97	3 0	0.81	1.10	0.88	1 83	1.26	9 3	1 28	9.8
15.....			0.97	3 0	0.85	1.50	0.87	1 72	1.22	8.2	1 27	9.6
16.....			0.90	2 0	1.04	4.1	0.87	1.72	1.20	7 7		
17.....			0.91	2 2	1.00	3 4	0.89	1.94	3.20	69		
18.....			0.98	3 2	0.91	2 2	0.90	2 0	3.30	72		
19.....			0.98	3 2	0.92	2 3	0.90	2 0	3.34	73		
20.....			0.99	3 3	0.86	1.61	0.92	2 3	3.10	66		
21.....			0.99	3 3	0.85	1 50	0.93	2 4	3.10	66		
22.....			1.01	3 6	0.82	1 20	0.95	2 7	3.05	65		
23.....	1.37	12.5①	1.02	3 8	0.79	90	0.95	2.7	3.01	64		
24.....	1.35	11.8	1.00	3 4	0.78	80	0.95	2 7	2.96	62		
25.....	1.50	16.5	0.98	3 2	0.76	60	0.97	3 0	2.87	59		
26.....	1.40	13 4	0.87	1.72	0.75	50	0.98	3 2	2.72	54		
27.....	1.37	12 5	0.87	1.72	0.79	90	1.00	3 4	2.40	44		
28.....	1.37	12.5	0.84	1.40	0.76	60	1.02	3 8	2 15	37		
29.....	1.32	11.00	0.84	1.40	0.75	50	1.04	4 1	2.12	36		
30.....	1.20	7.70	0.76	60	0.75	50	1.07	4.7	2.10	35		
31.....			0.76	60	0.74	42			2.10	35		

① Gauge established.

## DAILY GAUGE-HEIGHT AND DISCHARGE of Souris River near Estevan, for 1912.

DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			5.90		2.30		3.20		1.36	15.0
2.....			7.50		2.29		3.00		1.35	14.6
3.....			9.25		2.25		2.97		1.33	14.0
4.....			12.00		3.40		2.80		1.33	14.0
5.....			13.30		3.45		2.76		1.33	14.0
6.....			14.00		3.60		2.56		1.31	13.3
7.....			14.13		4.54		2.44		1.35	14.6
8.....			14.20		9.00		2.30		1.31	13.3
9.....			14.00		10.50		2.25		1.32	13.6
10.....			13.50		12.00		2.25		1.35	14.6
11.....			12.00		12.40		2.20		1.34	14.3
12.....			11.30		13.00		2.18		1.35	14.6
13.....			10.60		13.70		2.16		1.35	14.6
14.....			10.00		13.50		2.14		1.34	14.3
15.....			8.72		12.00		2.08		1.33	14.0
16.....			6.90		10.90		2.00		1.33	14.0
17.....			5.67		7.47		1.97		1.34	14.3
18.....			5.00		6.00		1.96		1.32	13.6
19.....			4.65		5.67		1.96		1.32	13.6
20.....			4.00		4.94		1.80		1.32	13.6
21.....			3.80		4.60		1.78		1.31	13.3
22.....			3.45		4.47		1.70		1.31	13.3
23.....			3.40		4.25		1.70		1.32	13.6
24.....			3.15		4.00		1.68		1.31	13.3
25.....			3.12		4.20		1.56	22	1.29	12.6
26.....			3.08		4.30		1.53	21	1.24	10.9
27.....	2.50	①	3.00		4.35		1.51	20	1.23	10.5
28.....	2.70		2.70		4.00		1.51	20	1.23	10.5
29.....	3.40		2.50		4.00		1.48	19.1	1.22	10.1
30.....	4.90		2.35		3.90		1.47	18.8	1.22	10.1
31.....	5.00				3.30				1.21	9.5

① Owing to no measurements being taken in high water no discharge can be computed until after June 24.

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Souris River near Estevan, for 1912.

DAY.	August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.19	8.8	1.08	4.0	1.07	2.8	1.19	6.5	1.09	3.3
2.....	1.19	8.7	1.08	4.0	1.07	2.8	1.19	6.5	1.09	3.3
3.....	1.19	8.6	1.07	3.7	1.07	2.8	1.18	6.1	1.07	2.8
4.....	1.17	7.9	1.06	3.4	1.06	2.6	1.17	5.8	1.07	2.8
5.....	1.16	7.4	1.06	3.3	1.08	3.0	1.14	4.7	1.07	2.8
6.....	1.14	6.7	1.06	3.3	1.08	3.0	1.14	4.7	1.09	3.3
7.....	1.14	6.6	1.05	3.1	1.08	3.0	1.14	4.7	1.09	3.3
8.....	1.13	6.3	1.06	3.1	1.08	3.0	1.13	4.4	1.09	3.3
9.....	1.13	6.2	1.06	3.0	1.09	3.3	1.15	5.0	1.09	3.3
10.....	1.09	4.9	1.06	2.8	1.11	3.7	1.17	5.8	1.07	2.8
11.....	1.09	4.9	1.05	2.5	1.12	4.0	1.17	5.8	1.07	2.8
12.....	1.07	4.2	1.05	2.3	1.28	9.7	1.15	5.0	1.06	2.6
13.....	1.06	4.1	1.06	2.6	1.29	10.1	1.13	4.4	1.06	2.6
14.....	1.06	4.1	1.06	2.6	1.28	9.7	1.13	4.4	1.05	2.4
15.....	1.06	4.1	1.06	2.6	1.28	9.7	1.13	4.4	1.03	2.0
16.....	1.05	3.6	1.07	2.8	1.28	9.7	1.12	4.0	1.03	2.0
17.....	1.05	3.6	1.07	2.8	1.27	9.4	1.15	5.0	1.02	1.9
18.....	1.07	4.1	1.07	2.8	1.27	9.4	1.15	5.0	1.02	1.9
19.....	1.07	4.1	1.08	3.0	1.26	9.0	1.15	5.0	1.02	1.9
20.....	1.08	4.3	1.08	3.0	1.26	9.0	1.16	5.4	1.01	1.8
21.....	1.08	4.3	1.09	3.3	1.26	9.0	1.09	3.3	1.01	1.8
22.....	1.09	4.5	1.09	3.3	1.25	8.6	1.07	2.8	1.01	1.8
23.....	1.10	4.8	1.08	3.0	1.24	8.3	1.07	2.8	0.99	1.6
24.....	1.08	4.1	1.08	3.0	1.24	8.3	1.07	2.8	0.99	1.6
25.....	1.08	4.1	1.09	3.3	1.24	8.3	1.09	3.3	0.99	1.6
26.....	1.07	3.9	1.08	3.0	1.23	7.9	1.09	3.3	0.99	1.6
27.....	1.07	3.9	1.07	2.8	1.23	7.9	1.07	2.8	0.98	1.5
28.....	1.06	3.6	1.07	2.8	1.21	7.2	1.07	2.8	0.98	1.5
29.....	1.09	4.4	1.07	2.8	1.21	7.2	1.08	3.0	0.97	1.4
30.....	1.09	4.4	1.06	2.6	1.21	7.2	1.08	3.0	0.97	1.4
31.....	1.10	4.6			1.21	7.2			0.97	1.4

## MONTHLY DISCHARGE of Souris River near Estevan, for 1911-12.

(Drainage area 4550 @ square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area	Total in Acre-feet.
1911.						
June (23-30).....	16.5	7.7	12.2	.003	0.001	194
July.....	22.7	.60	4.39	0.001	0.001	270
August.....	4.1	.50	1.49	0.003	0.0004	92
September.....	4.7	.42	1.91	0.0004	0.0005	114
October.....	73.0	.50	33.8	0.007	0.008	2,078
November (1-15).....	31.0	9.6	19.1	0.004	0.002	568
The period.....					0.0129	3,316
1912.						
June (25-30).....	22	18.8	20.2	0.004	0.001	239
July.....	15	9.5	13.2	0.003	0.003	812
August.....	8.8	3.6	5.15	0.001	0.001	317
September.....	4.0	2.3	3.02	.0006	0.0007	180
October.....	10.1	2.6	6.67	0.0010	0.002	410
November.....	6.5	2.8	4.41	0.001	0.001	262
December.....	3.3	1.4	2.26	0.0005	0.0006	139
The period.....					0.0093	2,359

① This area is only approximate, due to lack of reliable data.

② Not sufficient data to compute high water discharge in March, April, May and June.

## SOURIS RIVER NEAR GLEN EWEN.

This station was established on June 26, 1911, by J. C. Keith. It is located near D. F. Preston's house on the N. E.  $\frac{1}{4}$  Sec. 36, Tp. 2, Rge. 1, W. 2nd Mer., and is about three miles south and half a mile east from Glen Ewen.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to a post sunk in the bed of the stream on the left bank. The zero (elev. 78.98) is referred to a permanent iron bench mark (assumed elev. 100.00) on the left bank and within a few feet of the gauge.

The channel is slightly curved for some distance above and below the gauge. Both banks are steep, but will overflow in very high stages of the stream; both are partly covered with woods. The bed of the stream is composed of clean sand and gravel and may shift during high water. Beavers sometimes affect the records at the gauge by building dams and causing backwater.

Discharge measurements are made at the traffic bridge on the road allowance east of Sec. 2, Tp. 3, Rg. 1, W. 2nd Mer. during high stages and during low water periods are made by wading at a point about 400 yards below the gauge.

The gauge was read by Mr. D. F. Preston during 1911 and 1912.

## DISCHARGE MEASUREMENTS of Souris River near Glen Ewen, in 1911-12.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1911.						
June 26 . . . . .	J. C. Keith . . . . .	49	52.89	0.51	2.00	27.09
July 19 . . . . .	do . . . . .	30.5	14.80	.86	1.755	12.79
Aug. 24 . . . . .	do . . . . .	29.0	10.54	.50	1.63	5.26
Oct. 19 . . . . .	do . . . . .	45.5	31.17	1.07	2.35	33.52
1912.						
April 24 . . . . .	D. D. MacLeod . . . . .	55	228.65	1.24	4.15	282.68
May 10 . . . . .	do . . . . .	60	320.0	1.48	5.58	474.14
May 22 . . . . .	do . . . . .	60	313.5	1.37	5.38	428.82
June 26 . . . . .	H. D. St. A. Smith . . . . .	50.5	112.4	0.37	2.14	42.02
July 12 . . . . .	do . . . . .	44	53.85	0.45	1.95	24.23
July 27 . . . . .	do . . . . .	49	95.8	0.26	1.91	24.83
Aug. 13 . . . . .	do . . . . .	50	100.69	0.17	1.80	16.87
Aug. 30 . . . . .	do . . . . .	51	91.36	0.16	1.78	14.47
Sept. 12 . . . . .	do . . . . .	50	98.5	0.08	1.69	8.14
Sept. 25 . . . . .	do . . . . .	52	119.56	0.09	2.10	11.10
Oct. 10 . . . . .	do . . . . .	51	126.46	0.09	2.26	11.37
Oct. 24 . . . . .	do . . . . .	52	133.47	0.10	1.94	13.03
Nov. 9 . . . . .	do . . . . .	52	134.70	0.06	1.87	8.78

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## DAILY GAUGE-HEIGHT AND DISCHARGE of Souris River near Glen Even, for 1911.

DAY.	June.		July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.11	37.0	1.62	10.8	1.57	9.4	2.06	33	2.42	63
2.....			2.05	32.0	1.66	12.4	1.56	9.2	2.08	34	2.52	73
3.....			1.98	28.0	1.70	14.0	1.58	9.6	2.26	49	2.40	61
4.....			1.95	26.0	1.75	16.0	1.57	9.4	2.40	61	2.34	55
5.....			1.86	21.0	1.85	20.0	1.57	9.4	2.43	64	2.34	55
6.....			1.85	20.0	1.79	17.6	1.58	9.6	2.42	63	2.33	54
7.....			1.79	17.6	1.77	16.8	1.58	9.6	2.50	71	2.32	54
8.....			1.79	17.6	1.75	16.0	1.58	9.6	2.50	71	2.29	51
9.....			1.76	16.4	1.78	17.2	1.61	10.4	2.45	66	2.17	42
10.....			1.69	13.6	1.83	19.2	1.67	12.8	2.50	71	2.28	50
11.....			1.67	12.8	1.83	19.2	1.68	13.2	2.50	71	2.25	48
12.....			1.66	12.4	1.82	18.8	1.70	14.0	2.47	68	2.24	47
13.....			1.65	12.0	1.83	19.2	1.73	15.2	2.45	66	2.28	50
14.....			1.65	12.0	1.85	20.0	1.77	16.8	2.45	66	2.23	46
15.....			1.64	11.6	1.83	19.2	1.76	16.4	2.45	66	2.20	44
16.....			1.64	11.6	1.79	17.6	1.77	16.8	2.44	65		
17.....			1.64	11.6	1.78	17.2	1.75	16.0	2.40	61		
18.....			1.70	14.0	1.77	16.8	1.75	16.0	2.36	57		
19.....			1.74	15.6	1.75	16.0	1.76	16.4	2.35	56		
20.....			1.73	15.2	1.70	14.0	1.87	21.0	2.34	55		
21.....			1.72	14.8	1.69	13.6	1.91	24.0	2.31	53		
22.....			1.70	14.0	1.68	13.2	1.95	26.0	2.34	55		
23.....			1.75	16.0	1.65	12.0	2.00	29.0	2.79	101		
24.....			1.75	16.0	1.64	11.6	2.00	29.0	2.85	108		
25.....			1.76	16.4	1.63	11.2	2.04	31.0	2.83	106		
26.....	2.00	①29.0	1.75	16.0	1.57	9.4	2.02	30.0	2.80	102		
27.....	1.98	28.0	1.75	16.0	1.57	9.4	2.05	32.0	2.79	101		
28.....	1.96	27.0	1.70	14.0	1.57	9.4	2.06	33.0	3.04	131		
29.....	2.05	32.0	1.69	13.6	1.56	9.2	2.02	30.0	2.55	76		
30.....	2.10	36.0	1.66	12.4	1.57	9.4	2.05	32.0	3.00	126		
31.....			1.62	10.8	1.57	9.4			2.49	70		

①Gauge established on this date.



## DAILY GAUGE HEIGHT AND DISCHARGE of Souris River near Glen Ewen, for 1912.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			6.96	①	3.09	137	4.75	361
2.....			7.55		3.00	126	4.40	312
3.....			7.45		2.98	124	4.18	281
4.....			7.08		2.95	120	3.68	211
5.....			6.85		3.30	162	3.59	200
6.....			6.94		3.58	198	3.33	166
7.....			7.12		4.40	312	3.20	150
8.....			8.56		5.34	444	3.18	148
9.....			10.12		5.47	462	3.00	126
10.....			11.06		5.62	483	2.90	114
11.....			11.30		6.70	634	2.79	101
12.....			11.00		7.75	781	2.75	97
13.....			11.15		8.54	882	2.70	92
14.....			10.90		8.90	912	2.58	79
15.....			10.22	11.27	9.15	977	2.57	78
16.....			9.54	10.22	9.45	1019	2.55	76
17.....			8.32	889	9.63	1047	2.52	73
18.....			7.86	794	9.56	1025	2.45	66
19.....			6.20	564	9.03	960	2.42	63
20.....			5.37	448	8.14	835	2.40	61
21.....			5.00	396	6.35	585	2.35	56
22.....			4.77	364	5.45	459	2.32	54
23.....			4.40	312	5.10	410	2.25	48
24.....			4.15	277	4.85	375	2.21	45
25.....			3.85	235	4.67	350	2.18	42
26.....			3.75	221	4.54	332	2.14	39
27.....			3.54	193	4.74	360	2.11	37
28.....	4.70	①	3.35	168	4.64	346	2.09	35
29.....	5.13		3.20	150	4.57	336	2.05	32
30.....	5.38		3.15	144	4.63	344	2.03	31
31.....	6.00				4.83	375		

① Not sufficient data to compute discharge.

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DAILY GAUGE-HEIGHT AND DISCHARGE of Souris River near Glen Ewen, for 1912.

DAY.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.99	28	1.80	18	1.65	12	2.05	11	1.84	8.5
2.....	1.95	26	1.75	16	1.65	12	1.95	9.5	1.85	8.6
3.....	1.92	24	1.70	14	1.63	11.2	1.94	9.4	1.86	8.7
4.....	1.88	22	1.74	15.6	1.61	10.4	2.00	10	1.85	8.6
5.....	1.91	24	1.80	18	1.65	12	2.05	11	1.84	8.5
6.....	1.93	25	1.80	18	1.65	12	2.04	10.8	1.82	8.4
7.....	1.94	25	1.80	18	1.70	14	2.10	12	1.80	8.2
8.....	1.92	24	1.83	19.2	1.66	12.4	2.20	14	1.79	8.2
9.....	1.91	24	1.90	23	1.61	10.4	2.18	13.6	1.77	8.1
10.....	1.91	24	1.87	21	1.61	10.4	2.18	13.6	1.78	8.1
11.....	1.92	24	1.85	20	1.61	10.4	2.21	14.2	1.79	8.2
12.....	1.93	25	1.82	18.8	1.60	10	2.22	14.4	1.79	8.2
13.....	1.94	25	1.70	14	1.62	8	2.22	14.4	1.79	8.2
14.....	1.93	25	1.69	13.6	1.65	8	2.28	15.6	1.84	8.5
15.....	2.00	29	1.70	14	1.67	8	2.34	16.8	1.82	8.4
16.....	2.00	29	1.70	14.	1.71	8	2.35	17.		
17.....	1.97	27	1.71	14.4	1.74	8	2.33	16.6		
18.....	1.93	25	1.69	13.6	1.84	8.5	2.37	17.4		
19.....	1.86	21	1.70	14	1.87	8.8	2.40	18		
20.....	1.86	21	1.73	15.2	1.90	9	2.42	18.4		
21.....	1.93	25	1.74	15.6	1.94	9.4	2.40	18.		
22.....	1.85	20	1.70	14	1.93	9.3	1.86	8.7		
23.....	1.86	21	1.70	14	1.92	9.2	1.85	8.6		
24.....	1.93	25	1.69	13.6	2.01	10.2	1.84	8.5		
25.....	1.92	24	1.68	13.2	2.00	10	1.82	8.4		
26.....	1.88	22	1.88	22	2.02	10.4	1.80	8.2		
27.....	1.90	23	1.65	11.6	2.00	10	1.80	8.2		
28.....	1.93	25	1.73	15.2	1.98	9.8	1.80	8.2		
29.....	1.95	26	1.70	14	1.99	9.9	1.82	8.4		
30.....	1.86	21	1.68	13.2	1.96	9.6	1.82	8.4		
31.....	1.82	19	1.66	12.4			1.83	8.4		

MONTHLY DISCHARGE of Souris River near Glen Ewen, for 1911-12.

(Drainage area 7500① square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
1911						
June (26-30).....	36	27	30.4	0.004	0.001	701
July.....	37	10.8	16.7	0.002	0.002	1,026
August.....	20	9.4	14.7	0.002	0.002	904
September.....	33	9.2	18.6	0.002	0.002	1,144
October.....	131	33	72.4	0.010	0.012	4,452
November (1-15).....	73	44	52.9	0.007	0.004	1,573
The period.....					0.023	9,400
1912.						
April (15-30).....	1127	144	456	0.061	0.036	14,487
May.....	1047	120	514	0.069	0.080	31,605
June.....	361	31	109	0.015	0.017	6,486
July.....	29	19	24.1	0.003	0.003	1,481
August.....	23	11.6	15.8	0.002	0.002	971
September.....	18.0	8.00	10.0	0.001	0.001	595
October.....	18.4	8.20	12.3	0.002	0.002	756
November (1-15).....	8.7	8.10	9.36	0.001	0.001	249
The period.....					0.142	56,630

①This area is only approximate, due to lack of reliable data.

## SOURIS RIVER NEAR MELITA.

This station was established on July 20, 1911, by J. C. Keith. It is located at the traffic bridge on Sec. 6, Tp. 4, Rge. 26, W. Principal Mer.

The gauge, which is a plain staff graduated to feet and hundredths, is nailed to the west pile on the downstream side of the bridge. The zero of the gauge (elev. 84.13) is referred to a permanent iron bench mark (assumed elev. 100.00) on the right bank 51 feet from the end of the bridge.

The channel is straight for a distance above the station, but curves to the right a short distance below. The banks are high and partly wooded. The bed of the stream is composed of clean sand and gravel which may shift during high water.

Discharge measurements are made from the bridge, except during extreme low water when they are made by wading.

During 1912, the gauge was read by Mrs. A. Lawson, but owing to the inaccuracy of the observations the records were useless.

## DISCHARGE MEASUREMENTS of Souris River at Melita, in 1912.

Date.	Hydrographer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 25.....	D. D. MacLeod.....	93.0	569	1.47	6.45	848
May 11.....	do .....	98.0	464	1.25	5.22	580
May 23.....	do .....	96.0	395	1.21	4.65	477
June 27.....	H. D. St. A. Smith.....	85.0	235	0.775	2.87	173
July 13.....	do .....	77.4	162	0.559	2.07	90
July 29.....	do .....	80.0	169	0.432	2.15	73
Aug. 14.....	do .....	82.0	183	0.597	2.29	109
Aug. 31.....	do .....	81.0	188	0.600	2.30	113
Sept. 13.....	do .....	80.0	176	0.544	2.19	96
Sept. 26.....	do .....	79.0	162	0.484	1.94	78
Oct. 11.....	do .....	78.0	147	0.376	1.87	55
Oct. 25.....	do .....	77.0	149	0.348	1.81	52
Nov. 11.....	do .....	79.0	146	0.414	1.89	60

## APPENDIX.

RATING CURRENT METERS, BY H. O. BROWN, B.A.Sc.,  
DISTRICT HYDROGRAPHER.

**Introduction.**—The great advances during the past half century in the application of water from the natural streams for water supply, power and irrigation purposes, has led to extensive investigations being made of the flow of water in the different streams throughout the year. Especially in the United States, and of recent years in Canada, under the supervision of the governments of each country, respectively, have these investigations of stream flow been carried on. In this way complete records of the flow of the streams from day to day throughout each year are being obtained.

In Western Canada, where the work in this country was first extensively introduced, a special Hydrographic Surveys branch was organized under P. M. Sauder, C.E., in 1909. The work was carried on throughout the provinces of Alberta and Saskatchewan, and each year extended so that at the present time discharge measurements and observations are being made of nearly all the streams throughout the provinces.

Since stream measurements were first introduced, various methods have been employed to obtain the discharge or flow of the streams. The first methods were very crude and large errors were possible, but from time to time new and improved methods were introduced. The method of obtaining the stream discharge now almost universally adopted is the "velocity area" method. The area of the cross-section of the stream is obtained by the width of the cross-section being measured and soundings taken at equal intervals in the cross-section, the cross-section thus being divided into smaller sections. The mean velocity of the stream must next be obtained.

The velocity at different points across the stream may be obtained by direct or indirect methods. By the use of floats and float rods, the velocity may be obtained directly, but this method is greatly limited in its application as the necessary conditions of the stream are usually difficult to locate. The velocity of the stream is obtained indirectly by the use of current meters, where a known relation exists between the revolutions of the meter and the velocity of the water. The advantages of the current meter are easily recognized for with it the velocity at any point in the cross-section may be observed and the velocity observations are more easily and accurately obtained.

Since current meters were first introduced in the latter part of the eighteenth century many improvements have taken place. The first type of meter used was that of the float wheel, but this was soon modified to be used beneath the surface. In America patents were taken out as early as 1851. With these early types of meters great difficulty was experienced with the mechanical recording apparatus, due to the excessive friction, but with the introduction in 1860 of an electrical recorder this difficulty was eliminated. Of the many American types of meters which have been constructed, each for use under some special condition, those in most common use are the Price, Haskell and Fteley. The Dominion Irrigation Surveys use the different patterns of the Price meter exclusively, while the United States Geological Surveys have adopted the Small Price meter for their work, which has had many improvements in its construction introduced by their engineers from time to time.

**Methods of Rating.**—Rating a current meter is the determining of the relation existing between the velocity of the moving water and the revolutions of the meter wheel. Theoretically the ratings of all meters of the same make should be the same, but, owing to slight variations in construction, the ratings differ. The accuracy of a discharge measurement depends largely on the accuracy of rating the meter used. Errors of observation are as likely to be too large as too small and are therefore compensating. Errors in a rating table always have the same sign and are cumulative and should therefore be reduced to a minimum.

The method for rating meters now universally employed is that of moving the meter through still water with a known velocity. This method is sub-divided according to whether the meter is suspended from a car or boat, and moved in a straight line or suspended from the end of a long arm and moved in a circular path. The former is called the *linear method*, the latter the *circular method*.

In the linear method the meter is moved through still water along a straight run. A platform is placed by, or over, the water, as the case may be, carrying a track about 200 or 300 feet long, in which the car for carrying the meter is run. The track is laid near the edge of the platform and the meter is suspended in the water from an arm projecting from the side of the car. The car may either be propelled by hand or electrically. Observations of the distance, time

and number of revolutions for each run are noted and from these data the revolutions per second and velocity in feet per second are afterwards computed. Many runs are made for each meter, the velocity varying from the least that will cause the meter to revolve to several feet per second. The results of these runs when plotted define the meter rating curve for the meter and from this curve the rating table is computed.

The circular method of meter rating differs from the linear method principally in that the meter is moved in a circular path instead of along a straight path, as mentioned before, the observations taken in each case being practically the same. The meter is suspended from an arm projecting from, and supported by, a vertical centre shaft. The shaft may also be revolved by hand or electrically and a counter shaft with friction pulleys is used to obtain the low velocities. The meter is usually suspended from rods, for reasons stated later, and stay lines are used to keep the meter in place. A circular rating station is dependent upon a linear station for notes by which to adjust the distance of the meter centre from station centre. It has been found by practical test for a small Price meter suspended by rods that the distance is 8.95 feet, for a 60 feet run, or about 0.60 feet less than a 60 feet periphery geometrically requires, which is due to the actuating and resisting forces on a circular tract.

A limited number of comparisons have been made between the circular and linear methods of rating, and it has been found that the circular method of rating cannot be relied upon for rating with the cable, owing to the swinging out of the meter, which introduces an uncertainty in the distance of the run. The ratings on the rod by the circular method agree with the ratings obtained by the other method, as the meter is held firmly in place. It has however been found, that, owing to the vibration of the car in the linear method, the meter, when suspended on a rod, is retarded somewhat. Therefore, the results of ratings on a cable in this method are being used in preference to those on a rod, even though the meter is used on a rod. While the matter has not been fully investigated, it is believed from the data available that in actual field practice there is no difference between the suspension on a rod and on a cable. The ratings by the circular method on a rod have been found to agree with those by the linear method on a cable, which indicates that in the linear method the rod ratings are affected.

**Description of Station and Apparatus.**—The current meter rating station of the Department of the Interior, Irrigation Office, at Calgary, Alberta, was constructed early in the season of 1911. It was in operation during the latter part of the open season of the same year and the results obtained proved very satisfactory. At the opening of the season of 1912 the necessary attachments were placed on the car for rating with a cable and a few other improvements made in the apparatus. The station was in operation throughout the whole season until freeze-up and besides rating the meters used by the Dominion Irrigation Surveys several meters were rated for other parties. In the following pages will be given a brief description of the rating station and apparatus.

The still water is provided by a concrete tank 250 feet long by six feet wide and five and a half feet deep (inside dimensions), the depth of water in the tank being maintained at about five feet. The track laid along the side of the tank upon which the car is run is of 16 pound steel rails, laid to a gauge of  $32\frac{3}{8}$  inches on 4" x 6" ties. Great attention was paid in the laying of the track to have it laid solid and as level as possible with close rail joints (fish plates and bolts being used at every joint) in order that the car should run very smoothly. In the design of the car, which is propelled by hand, the main features have been copied from the car used by the Bureau of Standards, United States Government, at their rating station at Washington, D.C.

The axles of the car run in roller bearings and the frame supporting the front axle with bearings is attached to the platform of the car by a hinge joint. This allows the four wheels of the car to rest upon the track, though it be slightly uneven in places, and makes the level of the platform dependent upon the rear axle. It is thought that this arrangement eliminates all the sharp, vertical movements which might otherwise be transmitted to the current meter in its travel through the water. Two iron arms project from the car to the centre of the concrete tank and these hold the rods, or cable, from which the meter is suspended for rating. Iron arms also project on either side and at right angles to the lower arm for attaching a wire stay line to the meter, when being rated on a cable or small rods. The wheels of the car are solid castings and all the steel in the car is of heavy section, it being easier to maintain a uniform rate of travel with a heavy car than with a light one.

The diagram on plate No. 1 represents the electrical connections used for the recording apparatus at the rating station. As stated before, observations of the distance, time and number of revolutions for each run must be taken. The run is of a fixed distance of 200 feet (25 feet being left at each end for starting and stopping the car), therefore the number of revolutions and the time of the run only have to be observed. The time of the run is recorded automatically by an electro magnet operating a stop watch. A switch is placed at each end of the run and the car in passing over each closes the electric circuit in which the stop watch electro magnet is connected. This causes the steel core to be drawn up into the solenoid by magnetic force and a lever fastened to the end of the core pushes on the stop watch stem. At the beginning of the run the watch is thus started by the car closing the first switch and stopped at the end of the run when the other switch is closed. The double throw switch is used to throw three extra cells into the circuit by moving the blade over, as shown, when the switch at the *out* end of the run is to

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operate, for here the resistance of the circuit is increased. This arrangement prevents the watch from being struck too hard a blow by nine cells being in the circuit instead of six as required for the switch being operated at the *in* end.

The revolutions of the meter for each run are also automatically recorded by an electric recorder arranged in circuit with the meter, as shown in the diagram. The circuit for recording the revolutions of the meter is ready to be closed by the contact in the meter head, when a switch on the car is thrown in, as the starting post is reached. The meter continues to record until the end of the run is reached and then the circuit is again broken by a switch on the car being opened as the end post is reached.

As the meter seldom records exactly at the beginning and end of each run a small error is introduced in taking the recorded revolutions as the revolutions for the time of the run. For this reason the writer adopted the following method of obtaining the data for more accurate calculations of the revolutions per second of the meter for each run.

When the car has passed the starting post, when a run is being made, as the first contact of the meter is recorded a separate stop watch is started, independent of the watch recording the time of the run. The first time the meter wheel records may be a few feet past the starting post but the time for this unknown part of a revolution of the meter over this distance has not been recorded either. The number of revolutions of the meter after the watch has been started is observed until the meter is almost at the end of the run when the stop watch is again stopped at the end of a complete revolution of the meter as recorded. Thus the time for an exact number of revolutions of the meter and this exact number of revolutions of the meter have been observed for the run and from these data it is seen that the revolutions per second are more accurately calculated. In this way the error pointed out above was greatly eliminated and better defined rating curves were obtained.

**Rating meters.**—The method of suspension employed in the rating of the meter depends upon the type of meter. For the reasons mentioned before, all the meters that can be suspended from a cable are rated thus, but the meters designed for use on rods only necessarily have to be rated upon the rods. When the meter is suspended by a cable, it is fastened to the upper part of a hanger to which the cable is attached and the meter in this position is free to tilt up or down. The lead weight (for large meters, 15 pounds, and for small meters, 12 pounds) to keep the meter in position in the water is fastened below the meter upon the hanger. The stay line is fastened to the top of the hanger and to the end of the arm on the car for this purpose and facing the direction in which the run is to be made. The suspension cable used is an electric cable which is about a quarter inch thick. This cable avoids the use of an extra cable for the electric circuit and is also as used upon the meters in the field. It is passed through the loop in the lower arm projecting from the car and fastened to a swivel on the upper arm. The length of the suspension cable is just sufficient to allow the meter to hang about two feet below the surface of the water and by means of the swivel the meter is easily faced in the proper direction. Care must be taken to see that the meter rests horizontally and parallel to the direction of the run and that the electric wires connected to the meter will not cause the meter to alter its position when in motion or interfere with the meter wheel.

When the meter is suspended from rods, it is, as mentioned before, placed about two feet below the water surface. The rods are firmly held in the arms projecting from the car and very light waterproof electric cable is fastened to the meter for the electric recording circuit. A stay line is also fastened to the meter, when the rods used are light enough to bend when the high velocity runs are being made. The necessity for this will be stated later in another part of this paper.

The meters are usually rated first in the condition in which they have been sent in from the field and then, if necessary, are thoroughly cleaned, fitted with a new bearing, properly adjusted and oiled and rated again. In all cases it is necessary to see that the commutator in the meter head is adjusted to give a good contact to properly operate the electric recorder, which will not operate with as small an electric current as the telephone recorder used in the field.

In rating the meter several runs are made, usually about twenty, with velocities varying from the least that will cause the meter to revolve to about ten feet per second. It is very essential that the velocity for each run be uniform throughout and that this velocity be attained some distance back from the starting point, that the meter wheel may reach the corresponding revolutions per second. After the first run has been obtained the velocities for the following runs are increased by a half-foot per second, respectively, as nearly as possible, so as to give points for the rating curve which will be uniformly distributed.

For each run, as stated before, the time is automatically recorded and the length of the run being 200 feet, the velocity in feet per second is computed from these data. Also the time of a certain number of revolutions of the meter wheel having been observed for each run, the corresponding revolutions per second are computed and these results being plotted with revolutions per second and velocity in feet per second as co-ordinates locate the points which define the rating curve.

The rating curves are plotted on cross-section paper, the scales used being: five centimetres equal to 0.5 revolutions per second on the "Y" axis for high and low velocities and five centimetres equal to 1.0 foot per second on the "X" axis for high velocities, with five centimetres equal to

0.5 feet per second for the low velocity curve. When two curves are drawn separately for the high and low velocities, respectively, the rating curve usually consists of two straight lines, the break occurring very close to a velocity of 2.00 feet per second. Theoretically there is no pronounced break in the rating curve at this point, but, owing to the fact that the curvature is so decidedly small both above and below this point, it was decided to draw the curve as two straight lines. When plotting the curve the high velocity curve is usually drawn first and the point of revolutions per second corresponding to the velocity of 2.00 feet per second is transferred to the low velocity scale and the low velocity curve drawn from this point downward.

On each separate rating curve sheet for each meter, besides the rating curves for that meter, is placed the standard rating curve for that type of meter. This curve is used as a comparison for the other rating curves of the meter, and these rating curves being placed together on the same sheet, the general behaviour of the meter from rating to rating may be observed.

**Construction of the Rating Tables.**—If the rating of a meter comes within one or two per cent of the "standard" curve for this type of meter then the standard table is accepted for this meter. If the rating shows a greater difference than this then an individual table is constructed from the rating curve.

Two general forms of rating table are in use: one which gives the velocity to the nearest 0.01 foot per second corresponding to each 0.01 revolution per second from 0.0 to that corresponding to the highest velocity, for which the meter shall be used; and another form which gives the velocity to the nearest 0.01 foot per second corresponding to a certain number of revolutions in a certain number of seconds. The number of revolutions for this latter form of rating table is 5, 10, 20, 30, etc., and the time period being 30 to 60 seconds or 40 to 70 seconds. During the past season both these general forms were made out for each meter by the Department of the Interior, but it is intended to adopt the Revolution-Time form. The 40 to 70 second form of the Revolution-Time table has been used because of the lower velocities given and also the time of an observation being necessarily increased, but it also has the slight disadvantage that the velocities do not increase continuously between the 5, 10 and 20 revolution columns as in the 30 to 60 second table.

The Revolutions per Second-Velocity per Second table is constructed from the rating curve by reading the V.P.S. corresponding to each .05 R.P.S. and then filling in velocities corresponding to each .01 R.P.S. by dividing the differences evenly. The rating table of the second form gives the equivalent R.P.S. for the number of revolutions for each second of time between 40 and 70, so in constructing the table of this form, observations are taken from the curve of the velocities corresponding to each five seconds of time throughout the table. The differences in this form cannot be divided evenly between these points because the R.P.S. do not increase uniformly, so the differences must be divided proportionally to the increase of R.P.S. When the table of the first form is constructed first, the greater part of the table of the second form can be filled in from it and thus reduce the number of calculations.

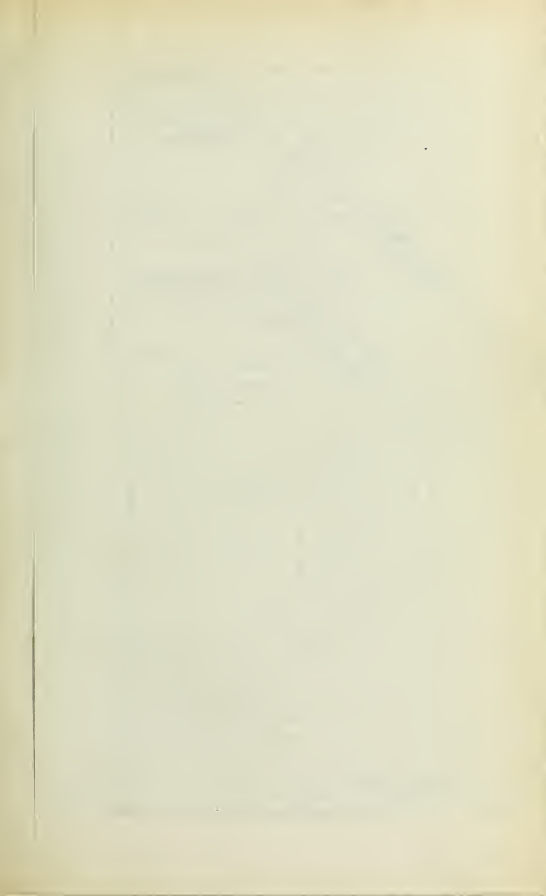
One disadvantage given by engineers for the table of the second form is that it is necessary to interpolate to obtain the velocity, when the time of the observation is observed to the fifth of a second. For the low revolution columns it is not necessary to interpolate if the time is observed to the nearest half-second, as the velocity increase is small, but in the columns from twenty revolutions upwards the velocity differences increase rapidly. The time being observed to the fifth of a second it seems, to the writer, that tables made out for each fifth second would be very helpful. These could be constructed by the engineer from the present form of rating table for velocities between the limits in his work.

**Some Observations Regarding Meter Rating.**—During the season of 1912 only a limited number of experiments in connection with current meter rating could be carried on at this station because of the large number of meters rated for field use by the Department and also many for outside parties. In connection with these experiments and the regular work, however, some interesting observations were made which will be noted in the following. Some of these observations are verified by the United States Geological Survey ratings, but others the writer would like to see taken up by other rating stations.

Several small Pri e meters (pattern 621 and 623) were rated suspended from a cable and in the same condition suspended from rods. For each meter the rating upon the rods gave a *lower* curve than that for the meter suspended from a cable. This difference is shown by the rating curves on plate No. 2. Also several large Price meters (pattern 600) were rated upon a cable and upon rods respectively. For each of these meters the rating upon the rods gave a *higher* curve than that upon the cable, or just the opposite to what was observed for the small meters. Curves illustrating this are also shown on plate No. 2.

The small Price meters (pattern 618), which are for use on rods only, when rated upon rods supported with a stay line, and again unsupported, gave two different rating curves. For the low velocities the curves are almost identical, but for the low velocities approximately above three or four feet per second, the rating curve for the meter unsupported gradually drops below that for the other rating (see plate No. 3). This is probably due to the rods bending a good deal in the higher velocities, when unsupported, and this tilting the meter downwards which lowers the R.P.S. corresponding to the V.P.S.

Some of the large Price meters, pattern 600, when sent in from the field to be rated, had the cone points worn round on top and also the tips loosened. The ratings of these meters in this





# Department of the Interior

IRRIGATION OFFICE.

## RATING CURVES

for

METER N<sup>o</sup> 1456-57

GURLEY PATTERN 623

Rated September 10<sup>th</sup> 14<sup>th</sup> 1912  
at

Department of the Interior Rating Station  
Calgary, Alta.

Meter not free to tilt when rated on rods  
And Curves for meter N<sup>o</sup> 247 \*

Pattern 600 Rated Sept. 12<sup>th</sup> 1912.

\* Note:- Rating on rods gives a much  
higher curve than that on cable  
for this pattern.

Meter free to tilt when rated  
on rods

Fig No 2.

Curve 1191  
Pattern 623

Rating on cable  
Rating on rods

Rating on rods  
Rating on cable.

Curve 1191  
Pattern 600

Velocity in feet per second.



# Department of the Interior

IRRIGATION OFFICE

RATING CURVES

for

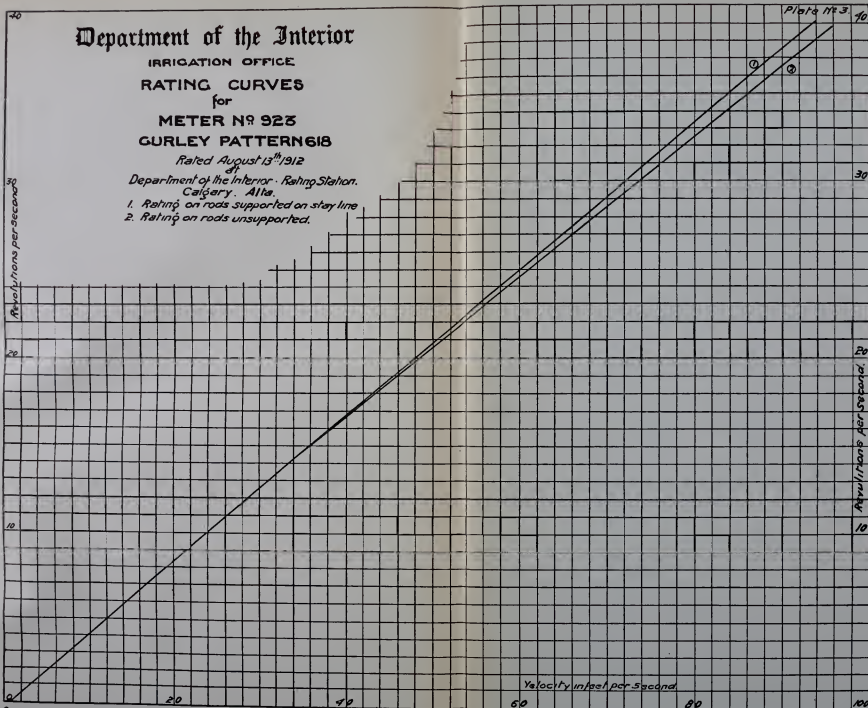
METER NO 923

GURLEY PATTERN 618

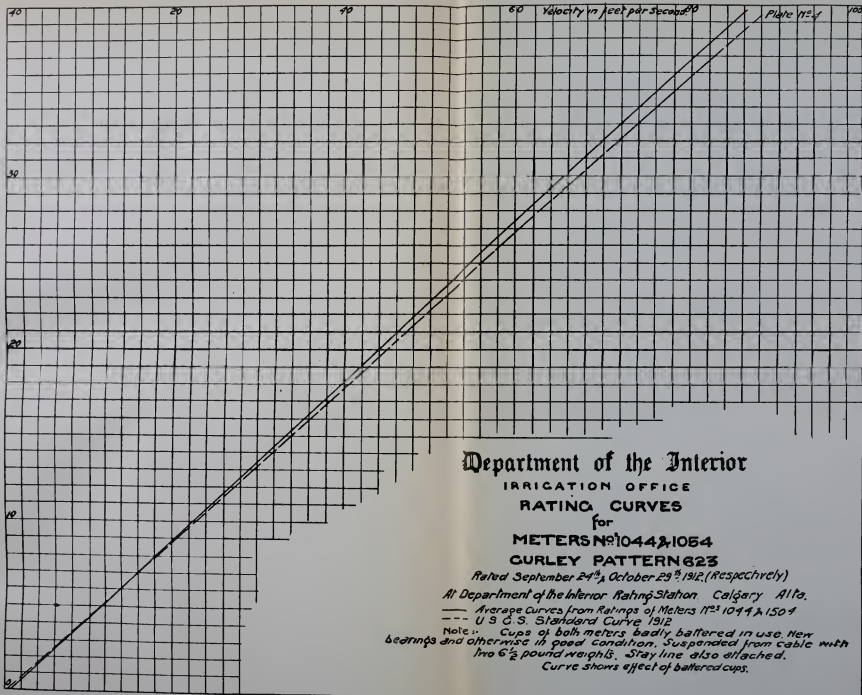
Rated August 13<sup>th</sup> 1912

Department of the Interior - Rating Station.  
Calgary, Alta.

1. Rating on rods supported on stay line
2. Rating on rods unsupported.







# Department of the Interior

IRRIGATION OFFICE

RATING CURVES

for

METERS No. 1044 & 1054

CURLEY PATTERN 623

Rated September 24<sup>th</sup>, October 29<sup>th</sup> 1912 (Respectively)

At Department of the Interior Rating Station Calgary Alta.

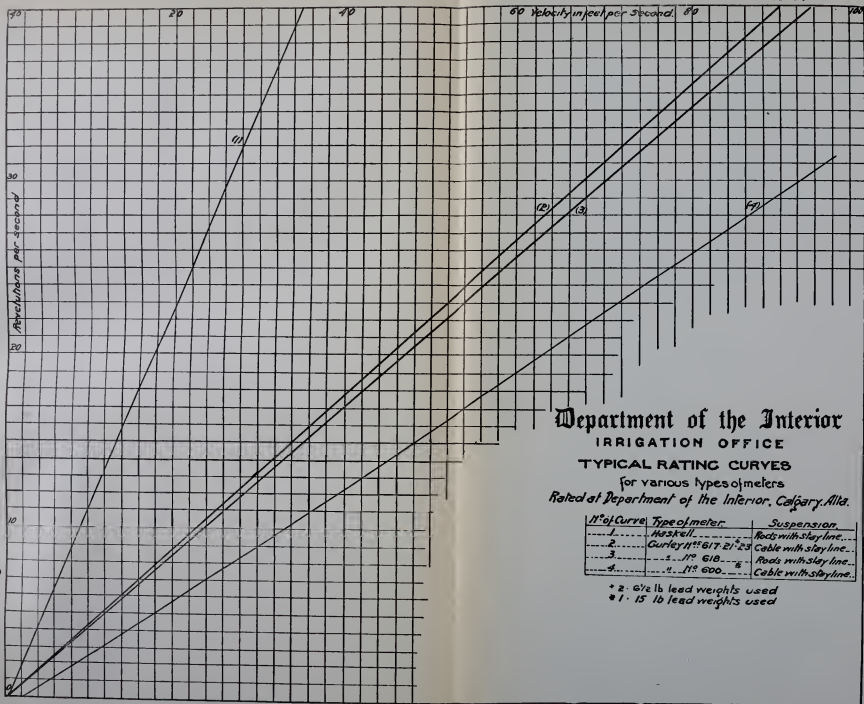
— Average Curves from Ratings of Meters Nos. 1044 & 1054

- - - U. S. C. S. Standard Curve 1912

Note. — Cups of both meters badly battered in use. New bearings and otherwise in good condition. Suspended from cable with two 6½ pound weights. Stay line also attached.

Curve shows effect of battered cups.

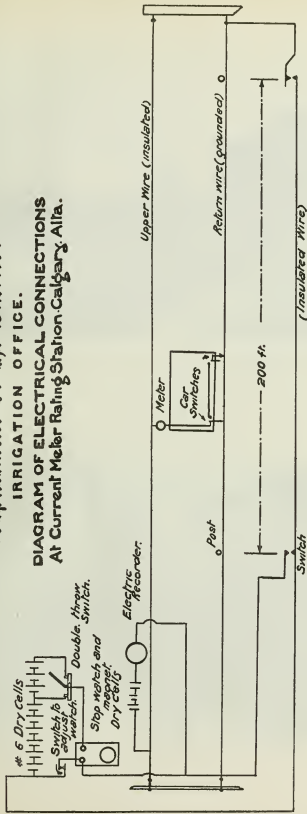




# Department of the Interior

## IRRIGATION OFFICE.

### DIAGRAM OF ELECTRICAL CONNECTIONS At Current Meter Rating Station Calgary, Alta.









View of Current Meter Rating Car showing the trolleys and switches. Taken by H. O. Brown.



Recording apparatus at the Current Meter Rating Station. Taken by H. O. Brown.



## SESSIONAL PAPER No. 25d

condition in each case gave a low rating curve compared with the "standard" for this pattern. The meters being fitted up with new cone bearings and rated again gave, in each case, a rating curve almost identical with that for the old bearing. The reason for this may be that the shaft bearing upon the meter wheel which bears upon the cone would probably have become worn to fit the old cone bearing and thus the sharp point of the new cone bearing would not remain at the centre of the worn shaft bearing.

Three or four meters of the small Price pattern were sent in by outside engineers to be rated at the station, and each of these meters had the cups on the bucket wheel badly battered. The bottoms of the cone-shaped cups, which were originally circular, were, in some cases, very irregular, yet, for each meter the rating curve obtained was considerably above that of the standard curve for this type of meter. The curves on Plate No. 4 distinctly show this difference. The cause of this difference seems to be the change in shape and size of the cups due to being battered, for otherwise the meters were in good condition.

In rating the small Price meters of pattern 618, it was noted that the yoke-shaped frame holding the bearings, when at right angles to the direction of the run (or nearly so), allowed the wheel to revolve more easily than when parallel to the direction of the run. Therefore it was necessary to see that this frame was parallel to the direction of the run to give a constant rating. The ratings of pattern 623 meters with penta and single revolution commutators were found to be identical.

When a strong wind was blowing directly down the tank it was found to cause currents in the water, which affected the ratings. This was noticed in that the number of revolutions of the meter passing over the same distance at the same velocity (approximately) was not the same when going against the wind and when going with the wind, there being less when going against the wind. This may hardly seem what would be expected, but the meter being placed about two feet below the surface is probably affected by undercurrents, compensating for the surface currents, caused by the wind, and in the opposite direction to these surface currents.

It has also been observed that it is most essential for the car to be started at a distance back from the starting post at the speed to be maintained throughout the run, so that the meter may be revolving uniformly upon the start. Though the proper speed of the car may be attained by starting only a short distance from the post, the bucket wheel of the meter cannot attain the corresponding speed as quickly and will therefore continue to accelerate after the run has started.

**Requirements of More Efficient Equipment at Rating Station.**—The three essential functions for ideal rating may be summed up as (1) uniform speed over a run of known distance (2); exact number of revolutions of meter wheel for this run and (3) exact time of run. Practically the rating equipment is constructed to fulfil these requirements as nearly as possible and should come very close to giving the best results.

When the car is propelled by hand a great deal of care must be exercised in order to keep the speed uniform throughout the whole run. Even after a good deal of practice slight variations in the speed, throughout the run, are often noticeable. For this reason an electrically-driven car, with a motor having a wide range speed control and supplied from a constant voltage line, is to be preferred to the hand driven car. The costs of the installation of the necessary equipment to have the rating car electrically driven might seem to be high at first cost, but this would be compensated by the fact that the services of an operator for propelling the car would not then be required.

The equipment and methods employed in obtaining the observations do not fulfil the necessary requirements as closely as that of the equipment adopted recently by the United States Bureau of Standards, though with care very satisfactory results have been obtained.

This new equipment referred to, and also its operation, may be briefly described as follows: A cog-wheel is electrically operated at each contact of the meter wheel, being moved by one cog for each complete revolution of the meter. Two pins are spaced in this cog wheel, the distance apart representing the number of complete revolutions of the meter desired for the run. These pins make the electrical connections which cause the apparatus recording the time, etc., to begin to operate at the beginning of the run and show the recorded results at the close of the run. The starting pin is placed a sufficient distance ahead of the contact point so that the desired speed may be obtained before the run over which the readings are to be taken is commenced. When the starting pin closes the contact, the time recorder is automatically started and also an arrow is shot into a soft pine plank to mark the start of the run. When the meter, in passing over the run, has recorded the number of revolutions for which the end pin has been placed, this end pin now causes all the recording apparatus to be stopped and also another arrow to be shot into an end plank marking the end of the run. The distance between these arrows, giving the distance of the run, is determined and the other data for this run is read from the recorders.

The disadvantage of having the run of fixed length is, as pointed out before, that it is impossible to obtain the exact number of revolutions of the meter, but this disadvantage was partly overcome, as mentioned. The new method of obtaining the time and distance of the run for an exact number of revolutions of the meter will be seen to be the more accurate method and would reduce the time required for the rating of a meter, as shorter runs than at present could be used. I would recommend that the Department install this new equipment at the beginning of next season.



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